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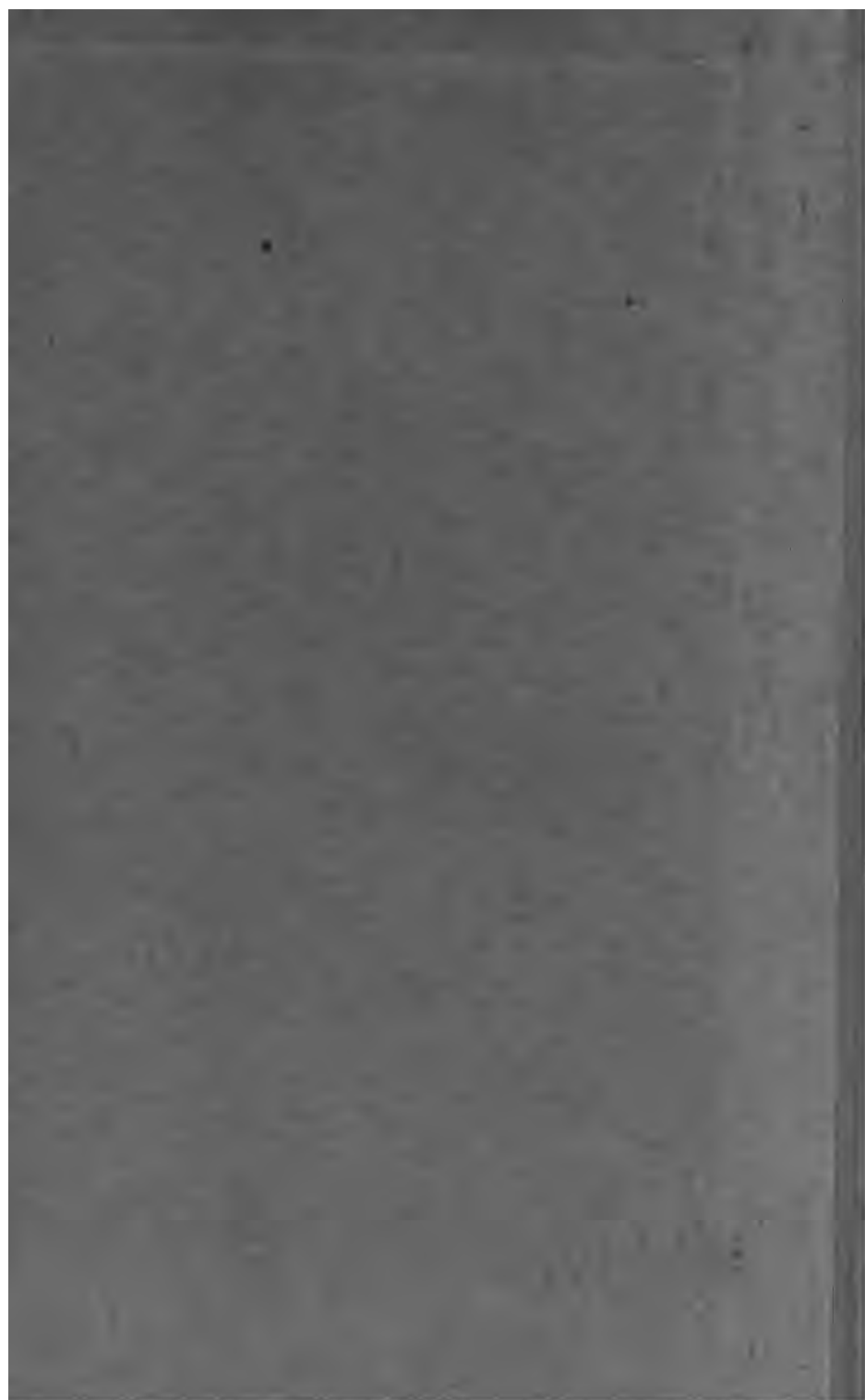


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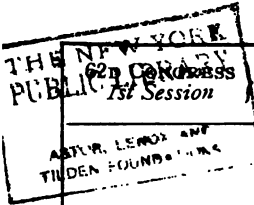




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PULP AND NEWS-PRINT PAPER INDUSTRY



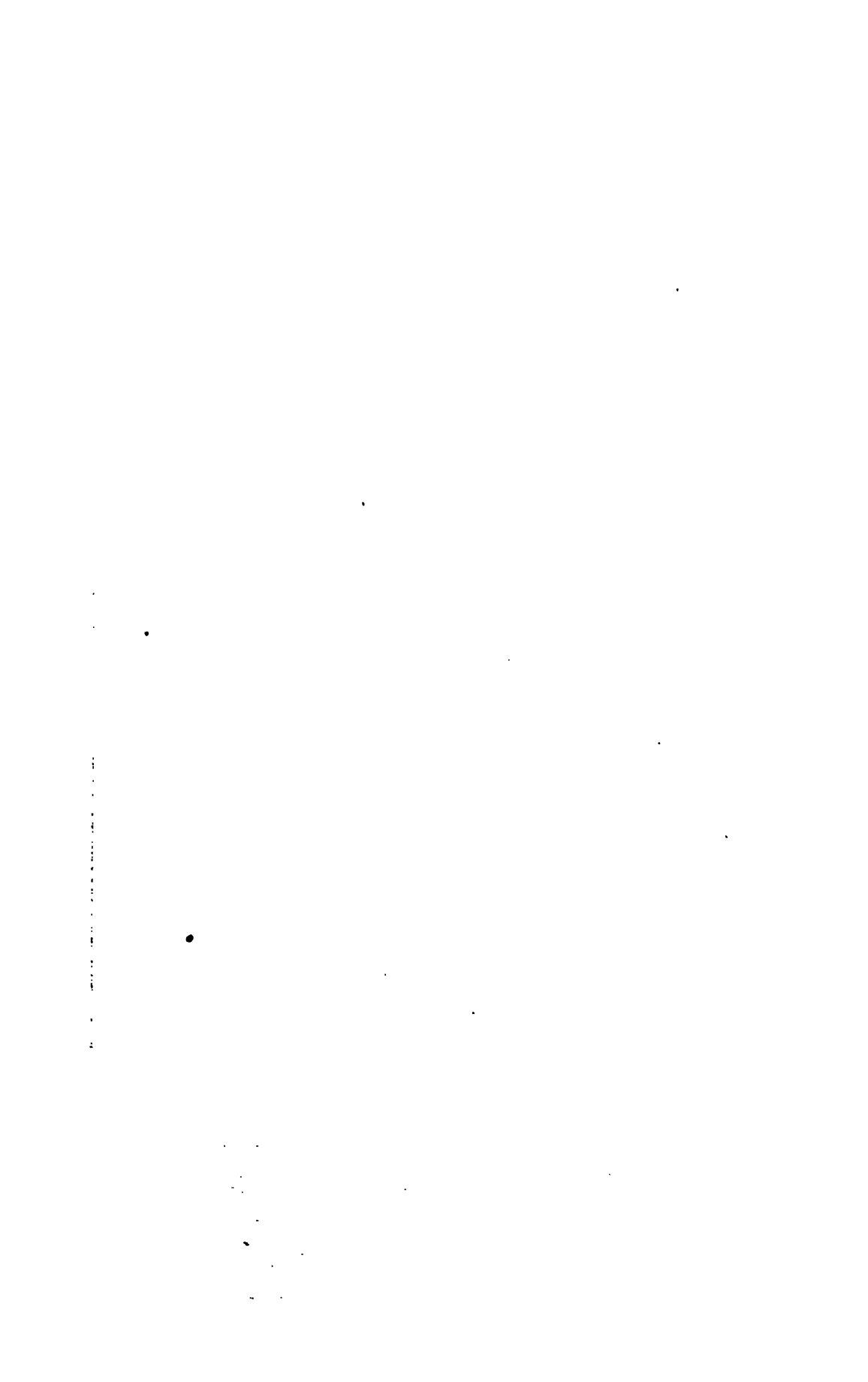
MESSAGE FROM THE
PRESIDENT OF THE UNITED STATES
TRANSMITTING A
REPORT BY THE TARIFF BOARD
RELATIVE TO PULP AND NEWS-
PRINT PAPER INDUSTRY :: ::

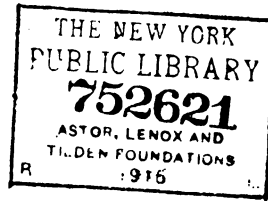


MAY 17, 1911.—Read; referred to the Committee on Finance
and ordered to be printed

WASHINGTON
1911

Beale
1911





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LETTER OF TRANSMITTAL.

To the Senate:

I have the honor to transmit herewith a report on the pulp and news-print paper industry by the Tariff Board. In response to a resolution of the Senate dated February 23, 1911, I forwarded a report by the Tariff Board answering as far as practicable the inquiries of that resolution. That report contained a preliminary report on the pulp and news-print paper industry.

As will be seen from the letter of transmittal, the present report is not a supplement to the preliminary report, but is a complete unit in itself.

WM. H. TAFT.

THE WHITE HOUSE, *May 17*, 1911.

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LETTER OF SUBMITTAL.

OFFICE OF THE TARIFF BOARD,
TREASURY BUILDING,
Washington, May 15, 1911.

The PRESIDENT:

I have the honor to present herewith a report of the Tariff Board on the pulp and news-print paper industry.

According to your instructions, we submitted to you on February 28, 1911, a preliminary report on this subject, in response to a resolution of the Senate dated February 23, 1911.

The board submits the present report not as a supplement to the preliminary report, but as a complete unit in itself. Certain differences between the earlier report and this completed report are the result of the inclusion of mills from which we had not received returns at that time. Other differences are due to a more detailed analysis of the schedules.

In addition to the material in the preliminary report we submit figures as to pulp-wood costs, intermediate profits, equipment and efficiency, prices, investment, and the relation of output to profit.

The data regarding wages and hours of employment in this country and Canada have now been made complete on the basis of the total production included by our investigation, which is practically 80 per cent of the output of news-print paper in the United States and about the same percentage of the output in Canada.

The significance of the data and the meaning of any differences between the figures of the preliminary report and this report are fully considered in the body of the report.

Respectfully submitted.

H. C. EMERY, *Chairman.*

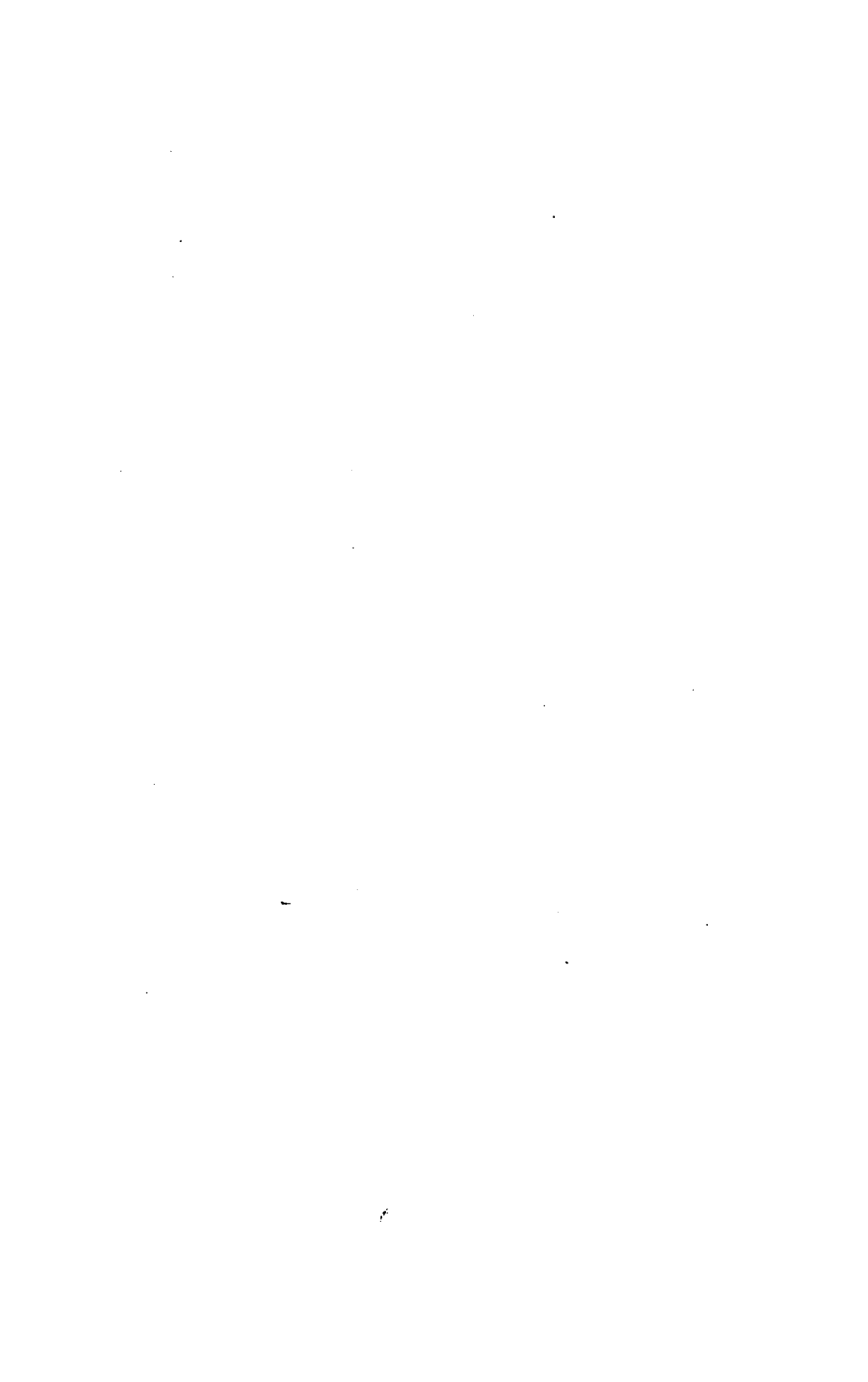


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PULP AND NEWS-PRINT PAPER.

PART I.

SCOPE OF INVESTIGATION.

The data on pulp and paper included in the following tables were secured from 53 ground-wood mills, 25 sulphite mills, and 38 news-print mills, making a total of 116 mills and representing 940,478 tons of news-print paper or 80 per cent of the news-print paper production of the United States. The data for Canada were taken from 13 ground-wood mills, 5 sulphite mills, and 7 news-print paper plants. Reports were secured covering 78.2 per cent of the news-print paper, 60.2 per cent of the ground-wood, and 55.7 per cent of the sulphite pulp capacity in Canada. This report does not deal with bleached sulphite pulp, sulphite made by the Mitscherlich process, sulphate, nor soda pulps.

All of these figures, including those from Canada, have been secured directly by our representatives from the books of the different companies. We prepared exact schedules including all essential items of equipment, cost, and wages; and for each of the companies included in the tables we have the original schedules covering all items in detail. Copies of the schedules used are herewith submitted, so that the true nature of the investigation may be understood.

[T. B.—1301. Confidential. Identification No. ...]

THE TARIFF BOARD.

PAPER AND PULP INDUSTRY.

SCHEDULE 1.—General information.

1. Name of firm or corporation.....
2. Address.....
3. Plants owned or operated, or subsidiary concerns controlled:

Name.	Location.
.....
.....
.....
.....

4. Articles manufactured (give list of articles manufactured):

Names of articles.	Unit.	Quantity.	Value.
.....
.....
.....
.....

We, the undersigned, certify that the figures and data given on the accompanying sheets (marked schedules 1, 2a, 2b, 2c, 3a, 3b, 4, 5, and 6) are taken from the books of accounting of the above-named firm, and are accurate and correct to the best of our knowledge and belief.

.....
.....
(Official position with the company or firm.)

.....
Accountant or Chief Bookkeeper.

PULP AND NEWS-PRINT PAPER.

[T. B.—1302. Confidential. Identification No. ...]

THE TARIFF BOARD.

PAPER AND PULP INDUSTRY.

SCHEDULE 2A.—*Equipment and operation of ground-pulp mills.*

Operations carried on during the year ended....., 191...

1. Name of plant.....

2. Location.....

3. Date of erection of plant.....; rebuilt.....

4. Power:

a. Water—Available horsepower,.....; actually used—highest,.....; lowest,.....

b. Steam—Available horsepower,.....

Boilers—Type.....; number.....; nominal horsepower.....

5. Barkers:

Number.	Type.	Make.	Capacity in cords, 24 hours.
.....
.....
.....

6. Grinders:

Number.	Number of pockets.	Type.	Make.	Year built.	Capacity in tons, 24 hours.
.....
.....
.....

7. Separators:

Number.	Type.	Make.
.....
.....
.....

8. Wet machines:

Number.	Type.	Make.	Year built.	Capacity in tons, 24 hours.
.....
.....
.....

9. Total labor pay roll for year, including foremen, \$.....

10. Number of full days (24 hours) plant was in operation during the year.....

PULP AND NEWS-PRINT PAPER.

9

11. Number of employees required to operate plant fully (one shift).....

12. Number of shifts per day.....

13. Length of each shift: Daily. Number of hours per week.

From..... to

From..... to

From..... to

14. Total one-man hours of labor in plant during the year....

15. Output per man per hour. (Not to be filled in.)

Remarks:

Data secured, 191.. Representative.

Agent.

[T. B. —1303. Confidential. Identification No. ...]

THE TARIFF BOARD.

PAPER AND PULP INDUSTRY.

SCHEDULE 2B.—*Equipment and operation of chemical pulp mills.*

Operations carried on during the year ended....., 191..

1. Name of plant.....

2. Location.....

3. Date of erection of plant.....; rebuilt.....

4. Chemical pulp:

(Strike out those not used.)

Soda, tons produced.....

Sulphite, tons produced.....

Sulphate, tons produced.....

5. Process used.....

6. Power:

a. Water: Available horsepower,; actually used—highest,; lowest,

b. Steam: Available horsepower.....

Boilers—Type.....; number.....; nominal horsepower.....

7. Barkers:

Number.	Type.	Make.	Capacity in cords, 24 hours.
.....
.....
.....
.....

8. Chippers:

Number.	Type.	Make.	Year built.	Capacity in cords, 24 hours.
.....
.....
.....
.....

PULP AND NEWS-PRINT PAPER.

9. Burners:

	Number.	Total sulphur burned in 24 hours (pounds).
Sulphur.....		
Pyrites.....		

10. Gas absorbers:

	Number.	Type.
Towers.....		
Tanks.....		

11. Digesters:

Number.	Type.	Tons capacity per 24 hours.	Hours required for one charge.

12. Washing tanks:

	Number.	Type.
Centrifugal.....		
Evaporators.....		

13. Total labor pay roll for year, including foremen..... \$.....

14. Number of full days (24 hours) plant was in operation during the year.....

15. Number of employees required to operate plant fully (one shift).....

16. Number of shifts per day.....

17. Length of each shift:

	Daily.	Number of hours per week.
From.....	to	
From.....	to	
From.....	to	

18. Total one-man hours of labor in plant during the year.....

19. Output per man per hour..... (Not to be filled in.)

Remarks.....

Data secured....., 191 ..

Representative.

Agent.

[T. B.—1304. Confidential. Identification No. ...]

THE TARIFF BOARD.

PAPER AND PULP INDUSTRY.

SCHEDULE 2C.—Equipment and operation of paper plant.

Operations carried on during the year ended, 191...

1. Name of plant.....

2. Location.....

11

4. Paper produced:

Kinds and grades.	Quantity.	Value.
.....
.....
.....
.....

b. Steam—Available horsepower,

6. Beaters, mixers, Hollands, and Jordan engines:

Number.	Type.	Make.	Year installed.	Capacity in tons, 24 hours.
.....
.....
.....

(Fourdrinier, cylinder machine, and supercalenders, etc., to be designated under "Type," and all inquiries applicable answered for each machine.)

Number.	Type.	Make.	Year of installation.	Size.	Width of roll.	Speed in feet per minute.	Capacity in tons, 24 hours.

12. Length of each shift: *Daily.* *Hours per week.*

From **to**

14. Output per man per hour.....

Remarks:

Data secured....., 191 .

PULP AND NEWS-PRINT PAPER.

[T. B.—1305. Confidential. Identification No. ...]

THE TARIFF BOARD.

PAPER AND PULP INDUSTRY.

SCHEDULE 3A.—*Cost of manufacture.*

Cost of manufacture of..... pulp for the year ended, 191..

1. Materials used:

NOTE.—Enumerate each item, including only such as are used directly on the product, whether purchased or made by this concern, but not including miscellaneous supplies; raw materials purchased should be stated at the cost set down at the works; materials manufactured by this concern should be stated at the actual cost.

A. Items.	B. Quantity used.	C. Range of cost price per unit. (Dollars.)		D. Total cost value. (Dollars.)	E. Average cost per unit of material D+B.	F. Average cost per unit of finished product D÷F.	G. Quantity of material per ton of product.
		Lowest.	Highest.				
					(Not to be filled in.)		
Wood.....							
Sulphur.....							
Pyrites.....							
Limestone.....							
Lime.....							
Soda.....							
Total materials.....							
2. Labor. (Manufacturing labor only including foremen.)							
Prime cost..... (Not to be filled in.)							

SCHEDULE 3A.—*Cost of manufacture*—Continued.

	Total cost. (Dollars.)	Average cost per ton.
3. Works expense:		(Not to be filled in.)
a. Supplies—		
1. Pulp stones.....		
2. Felts—		
Wool.....		
Canvas.....		
3. Wires.....		
4. Screen plates.....		
5. Belting.....		
6. Lubricants.....		
7. Fuel—		
Coal.....		
Wood.....		
.....		
Total supplies.....		
b. Water power		
c. Repairs and maintenance—		
Materials.....		
Labor.....		
d. Administration expense charge- able to manufacture		
e. Miscellaneous operating ex- penses		
f. Accident insurance, if any		
g. Hauling and stable		
.....		
Total works expense (a to g).....		

PULP AND NEWS-PRINT PAPER.

SCHEDULE 3A.—Cost of manufacture—Continued.

	Total cost (dollars).	Average cost per ton.
4. Fixed charges:		(Not to be filled in.)
a. Depreciation—		
Give depreciation chargeable to the part of the plant employed in the manufacture of above product, viz:		
1. Depreciation of the buildings—		
Valuation at cost, \$.....		
Annual depreciation rate..... per cent.....		
2. Depreciation and obsolescence of machinery and equipment—		
Valuation at cost, \$.....		
Annual depreciation rate..... per cent.....		
Total depreciation.....		
b. Fire insurance.....		
c. Taxes.....		
(Excluding Federal corporation tax.)		
.....		
Total fixed charges.....		
5. Total cost in bulk at the works.....		

6 Pulp produced (air dry):
 Total tons.....
 Tons per working day of 24 hours.....

	Dollars.	Average cost per unit of product.
7. Selling expenses (if pulp is sold to outside mills):		(Not to be filled in.)
(Amount chargeable to this product for salaries of officers, clerks, etc., on account of selling department, and other items in this connection.)		
.....		
.....		
.....		
Total selling expenses.....		

8. Gross sales:
 Tons.....
 Amount..... \$.....
 Kinds of wood used.....
 Remarks.....

Data secured....., 191..

..... Representative.

..... Agent.

PULP AND NEWS-PRINT PAPER.

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[T. B.—1306. Confidential. Identification No....]

THE TARIFF BOARD.

PAPER AND PULP INDUSTRY.

SCHEDULE 3B.—Cost of manufacture.

Cost of manufacture of.....paper for the year ended....., 191..
(Attach sample.)

1. Materials used:

NOTE.—Enumerate each item, including only such as are used directly on the product, whether purchased or made by this concern, but not including miscellaneous supplies; raw materials purchased should be stated at the cost set down at the works; materials manufactured by this concern should be stated at the actual cost.

A Items.	B Quantity used.	C Range of cost price per unit. (Dollars.)		D Total cost value. (Dollars.)	E Average cost per unit of material. D÷B.	F Average cost per unit of finished product. D÷6.	G Quantity of material per ton of product.
		Lowest.	High-est.				
(Not to be filled in.)							
Ground wood.....							
Sulphite.....							
Ground-wood screenings.....							
Sulphite screenings.....							
Soda and sulphite pulp.....							
Waste paper (purchased).....							
Cotton waste.....							
Bagging.....							
Fillers.....							
.....							
Alum.....							
Bleach and chemicals.....							
.....							
Color.....							
Sizing.....							
Total materials.....							
2. Labor.....							
(Manufacturing labor only, including foremen.)							
Prime cost.....							
(Not to be filled in.)							

PULP AND NEWS-PRINT PAPER.

SCHEDULE 3B.—Cost of manufacture—Continued.

	Total cost (dollars).	Average cost per ton.
3. Works expense:		(Not to be filled in.)
a. Supplies—		
1. Felts—		
Wool.....		
Canvas.....		
2. Wires.....		
3. Screen plates.....		
4. Belting.....		
5. Lubricants.....		
6. Finishing materials.....		
7. Fuel—		
Coal.....		
Wood.....		
.....		
Total supplies.....		
b. Water power.....		
c. Repairs and maintenance—		
Materials.....		
Labor.....		
d. Administration expense chargeable to manufacture.....		
e. Miscellaneous operating expenses.....		
f. Accident insurance, if any.....		
g. Hauling and stable.....		
.....		
Total works expense (a to g).....		
4. Fixed charges:		
a. Depreciation—		
Give depreciation chargeable to the part of the plant employed in the manufacture of above product, viz—		
1. Depreciation of the buildings—		
Valuation at cost, \$.....		
Annual depreciation rate..... per cent..		
2. Depreciation of machinery and equipment—		
Valuation at cost, \$.....		
Annual depreciation rate..... per cent..		
Total depreciation.....		
b. Fire insurance.....		
c. Taxes..... (Excluding Federal corporation tax.)		
.....		
.....		
.....		
Total fixed charges.....		
5. Total cost in bulk at the works.....		

6. Paper produced:

Quality (weight per ream of sheets of given size).....
 Quantity (tons).....
 Tons per working day of 24 hours.....

	Dollars.	Average cost per unit of product.
7. Selling expenses:		(Not to be filled in.)
(Amount chargeable to this product for salaries of officers, clerks, etc., on account of selling department, and other items in this connection.)		
.....		
.....		
.....		
Total selling expenses.....		

8. Gross sales:

Tons.....
 Amount..... \$.....
 Remarks.....
 Data secured....., 191 .

Representative

Field Agent

[T. B.—2. Identification No. ...]

THE TARIFF BOARD.

SCHEDULE 4.—Wages: Time workers.

General industry.....

Specific product.....; occupation.....

Working hours: Day shift a. m. to p. m., minutes for lunch.

Night shift p. m. to a. m., minutes for lunch.

Pay roll for.....

Number of employees.	Sex.	Days per week.	Hours.
			Full day.
.....
.....
.....

PULP AND NEWS-PRINT PAPER.

[T. B.—3. Identification No. ...]

THE TARIFF BOARD.

SCHEDULE 5.—Wages: Pieceworkers.

General industry..... Specific product.....
Occupation.....
Working hours: Day shift..... a. m. to..... p. m.,..... minutes for lunch.
Night shift..... p. m. to..... a. m.,..... minutes for lunch.
Pay roll for.....19..

Number of employees.	Sex.	Full time.			Actual time made and earnings	
		Days per week.	Hours.		in.....	
			Full day.	Hours worked.	Earnings.
.....	\$.....
.....
.....
.....

T. B.—4. THE TARIFF BOARD. Identification No...
Schedule 6.

- 1. What is your name?.....
- 2. In what country were you born?.....
- 3. How many years have you been in the United States?.....
- 4. Sex (male or female)?.....
- 5. Age?.....
- 6. Occupation (what work do you do)?.....
- 7. How much do you earn per day?.....
- 8. How many days do you work per week?.....
- 9. Number of hours per day?..... Per night?.....
- 10. Do you work day shift?.....
Night shift?..... Alternate?.....

[T. B.—1307. Confidential. Identification No. ...]

THE TARIFF BOARD.

PAPER AND PULP INDUSTRY.

SCHEDULE 7.—Prices.

Price of.....paper. Fiscal year ending....., 191..

A	B	C	D	E
Date of signing contract.	Period covered by contract.	Purchaser and city to which delivered.	Quantity of paper contracted for.	Price per 100 pounds delivered.
.....
.....
.....
.....

SCHEDULE 7.—Prices—Continued.

F Freight and cartage rate per 100 pounds.	G Commis- sion.	H Net price per 100 pounds at mill.	K Terms of sale. (State terms as to place of delivery, storage, allowance for return waste, etc.)
.....
.....
.....
.....

Remarks.....

Total actual deliveries during year: tons..... \$.....

Total amount paid for freight and cartage..... \$.....

Total commissions..... \$.....

Total discounts..... \$.....

Administration expense chargeable to selling department..... \$.....

Other selling expense, if any (specify expense).....

..... \$.....

Net amount received from sales..... \$.....

Average net price..... \$.....

Highest net price..... \$.....

Lowest net price..... \$.....

PART II.

PRODUCTION OF PULP AND PAPER IN THE UNITED STATES.

The news-print paper producing capacity of the United States under ordinary conditions exceeds one and one-third million tons per annum, which is more than one-fourth of all kinds of paper produced.

There are 824 plants making paper of some kind, and the total paper productive capacity is 5,196,398 tons. Thirty States, counting the District of Columbia as a State, produce paper in some of its forms.

TABLE 1.—*Productive capacity, in tons, of mills in the United States making each specified kind of paper, by States.*

States.	News-print and hanging.	Writing.	Book.	Tissue.	Wrapping.	Board.	Specialties.	Building and sheathing.	Total.
United States..	1,335,321	210,617	786,163	102,539	1,020,914	1,190,214	181,697	368,933	5,196,398
California.....					10,548	10,955		8,576	30,079
Connecticut.....	7,825	5,008	908	4,632	10,110	94,057	11,205		133,745
Delaware.....			20,877	157	1,377		532		22,943
Dist. of Columbia.....							2,504		2,504
Illinois.....					13,146	131,867		66,200	211,212
Indiana.....	10,548		4,476		44,509	139,066		20,095	218,693
Iowa.....					8,295	5,227		8,858	22,380
Kansas.....					4,100	4,163			8,263
Louisiana.....					5,478				5,478
Maine.....	346,178	14,085	107,985		117,062	38,280			628,590
Maryland.....	6,792		50,737		2,254	5,947		5,634	71,364
Massachusetts.....	15,932	103,634	128,737	4,664	9,171	86,983	22,120	51,676	422,926
Michigan.....	11,581	16,589	75,746	1,252	66,419	107,578	10,173	20,971	310,309
Minnesota.....	45,072					10,955		4,445	60,472
Missouri.....	15,650								15,650
New Hampshire.....	124,480		14,586	8,764	52,928	10,830	4,605		216,283
New Jersey.....			5,947	7,888	14,398	107,140	344	35,025	170,742
New York.....	490,158	814	67,577	46,762	224,734	208,178	43,883	35,463	1,117,567
North Carolina.....					6,260	5,227			11,487
Ohio.....	4,695	23,099	92,711	1,972	66,794	120,192	22,254	39,876	371,694
Oregon.....	55,088				18,874		313		74,275
Pennsylvania.....	10,204	11,080	121,100	876	97,875	80,879	4,914	92,179	419,107
Rhode Island.....								30	30
South Carolina.....							1,878		1,878
Texas.....					3,756				3,756
Vermont.....	17,059			16,620	12,677				46,356
Virginia.....		2,504	28,170		14,523	4,006	14,711		66,919
Washington.....	15,055		7,825		11,268	5,321	9,547		56,810
West Virginia.....					13,709				13,709
Wisconsin.....	159,004	33,804	88,781	8,952	22,693	5,008	3,130		30,831
					167,956	8,357	9,390		446,244

Table 1, page 20, compiled from the records of the American Paper & Pulp Association, which is the most reliable available source, represents productive capacity, and not actual output. In news-print paper are included news print in rolls and in sheets, and also hanging paper made in news-print mills. Hanging paper, when made in news-print mills, is made at practically identical cost of

production, the increased output making up for the additional cost in sizing.

The census reports for 1909 show 1,091,000 tons of roll print and 85,000 tons of sheet as the actual production for that year, a total of 1,176,000 tons. The Census Bureau gives 92,000 tons as the output of hanging paper, which, taken with the 1,176,000 tons of news print, gives 1,268,000 as the actual output in 1909, whereas Table 1, page 20, gives 1,335,321 tons as the productive capacity of these plants in 1910, a difference of 67,321 tons between rated capacity for production in 1910 and actual production in 1909; that is, the production was slightly less than 95 per cent of present capacity.

The inclusion of hanging paper with news print is made necessary by the fact that some plants make both on the same machines and make no distinction between them either in their output or costs. The fact that the same plants are and can be used for both shows that so far as productive capacity is concerned segregation is not important. Plants making hanging could change to news print, or vice versa, on demand.

The census tables follow:

TABLE 2.—Quantity and value of products—Comparative summary: 1909, 1904, and 1899.

Items.	Census.			Per cent of increase, 1899 to 1909.
	1909	1904	1899	
Number of establishments.....	787	761	704	11
Products, total value.....	\$267,400,000	\$188,710,000	\$127,807,000	110
News paper—				
In rolls, for printing—				
Tons.....	1,091,000	841,000	666,000	163
Value.....	\$42,807,000	\$28,706,000	\$18,756,000	175
In sheets, for printing—				
Tons.....	25,000	17,000	14,000	157
Value.....	\$4,000,000	\$3,100,000	\$4,000,000	100
Book paper—				
Book—				
Tons.....	575,000	440,000	300,000	192
Value.....	\$42,800,000	\$31,100,000	\$16,000,000	170
Cover—				
Tons.....	10,000	70,000	10,000	100
Value.....	\$1,700,000	\$1,100,000	\$1,000,000	100
Plate lithograph, map, warrant etc.—				
Tons.....	2,000	20,000	20,000	100
Value.....	\$25,000	\$1,000,000	\$1,000,000	100
Cardboard, Bristol board, card, stationery tickets, etc.—				
Tons.....	50,000	50,000	20,000	150
Value.....	\$4,000,000	\$1,000,000	\$1,000,000	100
Coated paper—				
Tons.....	10,000	11,000	11,000	100
Value.....	\$1,000,000	11,000	11,000	100
Fine paper—				
Writing paper—				
Tons.....	100,000	100,000	100,000	100
Value.....	\$10,000,000	\$10,000,000	\$10,000,000	100
All other fine paper—				
Tons.....	10,000	10,000	10,000	100
Value.....	\$1,000,000	\$1,000,000	\$1,000,000	100
Wrapping paper—				
Medium range, etc., etc., etc.—				
Tons.....	1,000	1,000	1,000	100
Value.....	\$1,000,000	\$1,000,000	\$1,000,000	100
Heavy wrapping with varnish, etc., etc.—				
Tons.....	10,000	10,000	10,000	100
Value.....	\$1,000,000	\$1,000,000	\$1,000,000	100

TABLE 2.—Quantity and value of products—Comparative summary: 1909, 1904, and 1899—Continued.

Items.	Census—			Per cent of increase, 1899 to 1909.
	1909	1904	1899	
Products, total value—Continued.				
Wrapping paper—Continued.				
Straw wrapping—				
Tons.....	33,000	54,000	92,000	1 64
Value.....	\$871,000	\$1,389,000	\$2,028,000	1 57
Bogus, or wood manilla, all grades—				
Tons.....	368,000	228,000	204,000	80
Value.....	\$19,780,000	\$10,100,000	\$9,149,000	116
All other wrapping paper—				
Tons.....	180,000	178,000	67,000	169
Value.....	\$10,202,000	\$8,775,000	\$3,293,000	210
Boards—				
Wood-pulp board—				
Tons.....	71,000	61,000	44,000	61
Value.....	\$2,639,000	\$2,347,000	\$1,406,000	88
Strawboard—				
Tons.....	172,000	167,000	158,000	9
Value.....	\$3,751,000	\$4,368,000	\$3,187,000	18
News board—				
Tons.....	75,000	39,000	32,000	134
Value.....	\$2,215,000	\$1,174,000	\$931,000	138
All other boards—				
Tons.....	514,000	254,000	132,000	289
Value.....	\$17,540,000	\$9,071,000	\$4,829,000	263
Other paper products—				
Tissues—				
Tons.....	78,000	44,000	28,000	179
Value.....	\$8,554,000	\$5,056,000	\$3,487,000	145
Blotting paper—				
Tons.....	10,000	9,000	4,000	150
Value.....	\$1,186,000	\$1,047,000	\$581,000	104
Building, roofing, and sheathing paper—				
Tons.....	218,000	145,000	97,000	125
Value.....	\$8,944,000	\$4,846,000	\$3,026,000	196
Hanging paper—				
Tons.....	92,000	63,000	54,000	70
Value.....	\$4,332,000	\$3,014,000	\$2,265,000	91
Miscellaneous—				
Tons.....	104,000	106,000	49,000	112
Value.....	\$7,141,000	\$6,730,000	\$2,796,000	155
Wood pulp made for sale—				
Ground—				
Tons.....	315,000	273,000	280,000	13
Value.....	\$5,736,000	\$4,323,000	\$4,434,000	29
Soda fiber—				
Tons.....	161,000	130,000	99,000	63
Value.....	\$6,770,000	\$5,160,000	\$3,613,000	87
Sulphite fiber—				
Tons.....	444,000	377,000	272,000	63
Value.....	\$17,943,000	\$13,661,000	\$10,451,000	72
All other products, value.....	\$4,738,000	\$1,924,000	\$919,000	416

¹ Decrease.

The ground wood and chemical pulp productive capacity in the United States is indicated by the following table, likewise compiled from the records of the American Paper & Pulp Association, and shows 192 ground wood pulp mills, having 1,485 grinders, producing 2,008,680 tons of air-dry ground wood pulp; 90 sulphite plants, producing 1,204,894 tons of air-dry sulphite fiber (bleached and unbleached); and 31 soda pulp plants, producing 417,387 air-dry tons of that commodity.

There are 555 digesters installed in the United States. The distributions of these between sulphite and soda pulp is not here attempted. Twenty-one States produce pulp of some kind and to some extent, as will be found detailed in the table.

TABLE 3.—*Productive capacity of wood-pulp mills, by specified kinds of pulp, by States and for the United States.*

	Ground-wood pulp.			Sulphite pulp.		Soda pulp.		Digest-ers.
	Number of mills.	Grinders.	Tons (air dry) produced in 1910.	Number of mills.	Tons (air dry) produced in 1910.	Number of mills.	Tons (air dry) produced in 1910.	
United States.....	192	1,485	2,008,680	90	1,204,894	31	417,387	555
California.....	1	4	6,260	1	6,260	1	19,563	3
Delaware.....	1	4	2,504	1	2,504	1	112,680	7
Indiana.....	1	4	2,504	1	2,504	1	112,680	61
Maine.....	26	329	491,880	12	189,991	5	32,865	13
Maryland.....	3	11	16,902	2	15,024	2	2,504	17
Massachusetts.....	5	20	21,128	7	58,844	1	2,504	37
Michigan.....	6	38	53,210	5	165,577	4	57,892	33
Minnesota.....	8	101	127,078	24	297,350	3	46,830	117
New Hampshire.....	83	518	755,739	2	28,953	3	46,830	17
New York.....	2	7	9,547	2	37,560	1	4,695	11
North Carolina.....	2	10	13,146	4	37,560	10	102,196	10
Ohio.....	5	81	103,603	5	69,173	1	11,738	104
Oregon.....	2	5	8,138	1	1,878	1	11,738	3
Pennsylvania.....	1	1	1,252	1	1,878	1	11,738	6
South Carolina.....	9	88	76,842	1	11,298	2	18,780	6
Texas.....	2	5	8,138	1	20,605	1	7,828	17
Vermont.....	1	10	10,955	1	15,050	1	7,828	10
Virginia.....	2	8	15,024	3	43,820	1	7,828	6
Washington.....	2	8	15,024	3	43,820	1	7,828	6
West Virginia.....	33	245	287,334	19	199,381	1	7,828	99
Wisconsin.....	33	245	287,334	19	199,381	1	7,828	99

PART III.

COST OF PRODUCTION IN THE UNITED STATES.

(A) EXPLANATORY STATEMENT.

The figures given are for manufacturing costs at the mill with each item as actually carried on the books. It should be carefully noted, however, that there are certain items in the blank schedules which are not included in the figures submitted.

First. Depreciation, it was found, was not carried as a cost item on the books of the manufacturers generally. Not more than 5 per cent of the tonnage was made by firms so carrying depreciation. Even with these the basis for the charge consisted of widely varying estimates of the amount which ought to be so charged. In this report, therefore, no account is taken of depreciation in the general table of costs, but a separate statement of depreciation is made, based upon the estimates and experiences of engineers whose business it is to build paper and pulp mills. (See p. 73.) By excluding depreciation from the general cost tables, the establishments are brought into the table on a uniform basis.

Second. The figures do not include interest either on the capital invested or on borrowed capital.

Third. There is no charge for water power except in the case of a few mills which rent their power from other companies. In almost all cases power development is reckoned as a part of the plant and not charged in separately.

Certain other facts must also be considered:

Wood is raw material for pulp and both kinds of pulp are raw material for paper. If pulp mills bought all their wood in the open market and if paper mills bought all their pulp in the open market these charges would be very simple. Complexity arises from the different methods of accounting on the part of mills that produce their own raw material. One pulp mill may charge in its wood cut from its own lands at the actual cost delivered to the mill, which because of favorable conditions may be very low. In the case of another company operating under similar circumstances, a pulp mill may be charged with the wood at the current market price and the difference entered as a profit on the lumbering operations. In the estimate of the actual cost of wood, one company may charge only a nominal stumpage, while another may charge stumpage at the current rates, or even higher.

In the same way, a paper mill operated in connection with a pulp mill may charge in pulp at cost, showing no profit on the pulp mill; or it may charge it in at market value, entering the difference to the profit of the pulp mill. Obviously, the cost of paper per ton and the margin of profit per ton, as shown by the books, will depend upon the methods adopted. Some companies prefer to charge in materials of their own at a very low figure, thereby showing a high margin of profit per ton on the finished product. Another company may make its charges in such a way as to show a large margin of profit per cord of wood or ton of pulp, and a very low margin of profit, or even an apparent loss on a ton of paper. The apparent cost of paper

in the two cases might be widely different, although if the figures were analyzed and reduced to the same basis they might show substantially the same result. It is a question of how far profits are charged in on the transfer of material from one department to another of the same concern.

In the tables here presented an effort has been made to reduce all items to a uniform basis for all plants before combining them into totals. While on the one hand the figures in the tables give costs as shown by the manufacturers' books, all costs have been gone over, and the stumpage, profits on woodland operations in excess of stumpage, profits on transfers of pulps from mill to mill, have been considered and a statement made of their amounts, so far as the actual returns show. That is to say, while the costs are given as the board found them to be on the books, information is given by which the uncertain elements of depreciation and interest may be considered and the elements of stumpage and profit on transfers are shown for the proportion of cost figures into which they enter.

Under repairs and maintenance some concerns charge all work done to keep up the efficiency of the plant. This includes both repair work, strictly speaking, including renewals which may have involved betterments in some cases, though this is not a serious item. Renewals which ought to be spread over a series of years are, it is true, in some cases charged in; but as these are spread over a number of plants for one year rather than one plant for several years, the final average is not seriously disturbed. No revision of this item is possible without an audit of every item of expense charged to the repair account for the time covered by the investigation.

If new construction is charged to repairs, the cost per ton for the period in question is, of course, enhanced; also, where figures are taken for only one year, it is possible that repair costs are included which should be properly distributed over several years. A mill may run for a long period with a very low charge for maintenance and repairs and then may pay for it by heavy expenditures during a few months. The figures which we have secured show, in some cases, charges under this head which would appear on their face to be abnormal, but which are explained by facts of this kind. In such cases a correct idea can be obtained by including only the proportion of the repairs normally chargeable to that year.

In the case of mills equipped with machines which are out of date, the cost would be increased not only by the lower efficiency of the machines, but by the more constant need for repair because of age; and the figures secured show wide divergencies in these items.

Where monthly figures have been secured, it appears that the costs in a single mill vary greatly from month to month of a given year. If the margin between selling price and manufacturing cost were taken on a basis of the best month, it would give an entirely wrong impression of the facts. Consequently contingencies of various kinds must be fairly considered, as in the case of every industry. Where an industry is dependent on water power, monthly cost will vary largely according to head of water, but if a period of 12 months is covered the ordinary season of fluctuations would disappear in the yearly average. Allowance must be made, however, for unusual and disastrous water conditions, either in the way of drought or flood. The nature of problems will, however, appear more clearly under the section on Interest and Depreciation.

In the next place it should be carefully remembered that the figures as here submitted do not include any statements as to capital investment. The relation of mill costs to selling price at the mill may be entirely misinterpreted by one not familiar with the investment of capital necessary for given output. Obviously the margin of profit per ton indicates of itself nothing as to the earnings on capital.

Finally, two other points arise in connection with the manufacture of pulp and paper which involve very difficult questions. These are due to the fact that the industry is dependent upon two natural resources—the forest for its raw material and water for its power.

Reference has already been made to the various methods employed by different concerns in estimating the value of stumpage in the cost of wood. A company which in former years secured valuable lands and water privileges at low prices can, by simply adding carrying charges into cost, show a figure for cost of production far below that of a new enterprise in the same locality. On the other hand, the company may, of course, prefer to hold its own land intact and buy wood in the market, if it believes that more will be gained by the increase in value of its timber than will be lost by the higher cost, for the moment, of its wood. The whole problem of the figure at which wood is charged into cost is, of course, inevitably bound up with the whole question of the appreciation of timber-land values.

The question of water power is of much the same kind. Unlike wood, it enters into the strict conversion cost. The development of the power represents a part of the capital investment. It is simply carried in this way and might naturally be expected to yield the same rate of profit on original investment as the balance of the capital employed.

The question arises, however, in case water power in a given section is increasing in value through demand for other purposes and competition of other industries, whether or not earnings to this extent will be adequate to keep an existing business established. In some cases mills are operating near industrial centers where water power converted into electrical power is selling at a very high price. Such mills, if charging power to themselves at current rates would show a prohibitive cost of manufacture.

These observations are made because it is essential to distinguish between strict cost figures and the margin between costs and prices. The former must be presented as actual costs of manufacture regardless of the investment. The question of what is a reasonable margin, however, inevitably involves a consideration not only of the original investment but of the appreciation in value of natural resources controlled, and their availability for other competing uses. In presenting the actual figures of cost, as shown from the books of the concerns, reference may be made to the somewhat widespread opinion that we should report not on actual costs but on some assumed cost for a supposedly "normal plant." This will be considered later, in Part X.

(B) TABLES AND COMMENT ON COST OF PRODUCTION.

The following cost tables have been compiled for a period of 12 months in the case of each mill. In all cases the last normal fiscal year was taken. The majority of the reports are for the year 1909.

These figures should be considered with careful reference to the preceding explanatory statement.

TABLE 4.—Summary of the cost of manufacture of ground-wood pulp, sulphite fiber, and news-print paper, showing total cost, highest, lowest, and average cost per ton of product, by specified items of cost for mills in the United States reporting data.

Items.	Total cost of specified items in mills reporting.	Cost per ton of product.		
		Lowest.	Highest.	Average.
Ground-wood pulp:				
Wood.....	\$7, 418, 586. 42	\$6. 90	\$13. 33	\$10. 23
Manufacturing labor.....	1, 578, 215. 95	. 98	5. 90	2. 18
Other costs.....	1, 581, 946. 95	. 30	6. 83	2. 18
Total cost in bulk at mills.....	10, 578, 749. 32	9. 80	21. 32	14. 59
Sulphite fiber:				
Wood.....	8, 204, 140. 66	13. 28	25. 89	18. 58
Manufacturing labor.....	1, 695, 108. 86	2. 09	6. 51	3. 84
Other costs.....	4, 223, 442. 32	6. 72	14. 68	9. 57
Total cost in bulk at mills.....	14, 122, 691. 84	24. 47	40. 16	31. 99
News-print paper:				
Materials—				
Ground-wood pulp.....	12, 481, 616. 83	8. 26	18. 54	13. 27
Sulphite fiber.....	8, 118, 307. 55	6. 45	14. 12	8. 63
Other materials.....	785, 481. 02	. 32	3. 25	. 84
Total materials.....	21, 385, 405. 40	15. 64	29. 22	22. 74
Manufacturing labor.....	3, 075, 148. 88	2. 19	7. 26	3. 27
Other costs.....	6, 460, 846. 11	4. 63	10. 05	6. 57
Total cost in bulk at mills.....	30, 921, 400. 39	24. 50	43. 00	32. 88

TABLE 5.—Cost of production of ground-wood pulp, sulphite fiber, and news-print paper in the United States, by classified rates of cost per ton.

Total cost per ton.	Number of establishments.	Tons produced.	Per cent of total production.	Average cost in each group.
Ground-wood pulp:				
Under \$10.....	2	111, 966. 6	15. 4	\$9. 90
\$10 and under \$12.....	4	50, 116. 1	6. 9	10. 90
\$12 and under \$14.....	7	107, 164. 8	14. 8	13. 48
\$14 and under \$16.....	16	197, 355. 3	27. 2	15. 18
\$16 and under \$20.....	22	246, 989. 8	34. 1	17. 18
\$20 or over.....	2	11, 661. 3	1. 6	20. 58
Total.....	53	725, 253. 9	100. 0	14. 59
Sulphite fiber:				
\$24 and under \$26.....	1	37, 725. 0	8. 5	24. 47
\$26 and under \$30.....	5	67, 731. 2	15. 3	28. 93
\$30 and under \$32.....	5	84, 728. 2	19. 2	31. 17
\$32 and under \$34.....	5	130, 851. 3	29. 7	33. 15
\$34 and under \$36.....	6	94, 711. 4	21. 5	34. 59
\$36 or over.....	3	25, 711. 4	5. 8	37. 14
Total.....	25	441, 458. 6	100. 0	31. 99
News-print paper:				
Under \$25.....	1	45, 022. 2	4. 8	24. 50
\$25 and under \$30.....	4	170, 319. 8	18. 1	26. 18
\$30 and under \$32.50.....	7	210, 215. 7	22. 4	31. 96
\$32.50 and under \$35.....	7	205, 992. 3	21. 9	34. 07
\$35 and under \$37.50.....	6	107, 373. 4	11. 4	36. 03
\$37.50 and under \$40.....	12	194, 604. 3	20. 7	38. 31
\$40 or over.....	1	6, 950. 4	. 7	43. 00
Total.....	38	940, 478. 1	100. 0	32. 88

TABLE 6.—*Manufacturing labor cost per ton of ground wood pulp, sulphite fiber, and news-print paper, by classified rates for mills in the United States reporting data.*

Range of labor cost per ton of product.	Number of establishments.	Tons produced.	Per cent of total tons produced.	Average cost per ton.
Ground wood pulp:				
Under \$1.....	1	38,498.5	5.3	\$9.98
\$1 and under \$1.50.....	2	26,599.3	3.7	1.34
\$1.50 and under \$2.....	16	302,964.6	41.8	1.69
\$2 and under \$2.50.....	11	134,869.0	18.6	2.33
\$2.50 and under \$3.....	11	146,827.9	20.2	2.81
\$3 and under \$3.50.....	7	36,374.3	5.1	3.26
\$3.50 and under \$4.....	4	36,484.3	5.0	3.59
\$4 and over.....	1	2,636.0	.3	5.90
Total.....	53	725,253.9	100.0	2.18
Sulphite fiber:				
Under \$2.50.....	2	34,863.3	7.9	2.26
\$2.50 and under \$3.....	4	71,094.1	16.1	2.87
\$3 and under \$3.50.....	3	51,055.2	11.6	3.41
\$3.50 and under \$4.....	4	51,023.8	11.5	3.86
\$4 and under \$4.50.....	5	156,356.8	35.4	4.15
\$4.50 and under \$5.....	4	49,871.3	11.3	4.71
\$5 and over.....	3	27,194.6	6.2	5.78
Total.....	25	441,458.5	100.0	3.84
News-print paper:				
\$2 and under \$2.50.....	2	93,286.9	9.9	2.24
\$2.50 and under \$3.....	5	297,275.5	31.6	2.84
\$3 and under \$3.50.....	10	225,901.7	24.0	3.20
\$3.50 and under \$4.....	9	192,079.3	20.4	3.65
\$4 and under \$4.50.....	9	104,569.2	11.1	4.22
\$4.50 and under \$5.....	1	12,077.3	1.3	4.85
\$5 and under \$6.....	1	8,337.8	.9	5.63
\$6 and over.....	1	6,950.4	.8	7.26
Total.....	38	940,478.1	100.0	3.27

COST OF PRODUCTION OF GROUND WOOD PULP.

Ground wood-pulp schedules are here tabulated from 53 pulp mills in the United States, most of them operated in connection with news-print paper mills, and all making mechanical pulp of the grade and quality entering into news-print paper. These 53 mills produced 725,253.9 tons of pulp at a cost of \$10,578,749.32, or at a consequent total average cost of \$14.59 per ton. The lowest cost in any mill was \$9.80, the highest \$21.32, showing a difference between the highest and lowest cost greater than the total lowest cost. The wood cost per ton of pulp ranges from \$6.90 for the lowest to \$13.33 for the highest, with an average of \$10.23. These variations are due partly to local conditions and partly to divergent methods of bookkeeping, as already explained in the preceding "Explanatory statement."

By manufacturing labor is meant the labor which is applied directly to materials in process; it does not include labor expended in repair of machinery nor upkeep of plant. Table 7 will show repair labor per ton of product for both the pulps and for paper, and this repair labor item must not be confused with process labor. Process labor in pulp and paper mills has been made to include labor engaged in production of power, i. e., engineers, firemen, etc. This was made necessary because paper and pulp manufacturers do not keep their immediately productive labor so carefully distinct from nonproductive and contributory labor, as do manufacturers in some other lines. It was, however, always possible to separate repair labor from that more

directly engaged in production. The extreme variation in the labor costs is due neither to difference in individual efficiency of labor nor to that in equipment, since the equipment of the grinding rooms is fairly similar in all mills under investigation. The difference is principally due to variations in available water power. A grinder built to operate under, say, 600 horsepower, and of a capacity of from 6 to 8 tons per day will turn out its full quota when water is plentiful and work is conducted under full pressure. As the water supply diminishes the productivity of the grinder rapidly falls off without allowing for any saving in the labor. The result is that the same amount of labor produces twice as much in one case as it will in another. The variation under the heading of other costs is likewise very wide. This item covers a large number of cost elements, such as repairs, general supplies, general works expense, office expense, etc., which will differ according to the age of the plant, the scale on which operations are conducted, etc.

Manufacturing labor cost averaged \$2.18 per ton for the entire tonnage reporting, but shows a range of from 98 cents for lowest to \$5.90 for highest. Other costs average \$2.18 per ton with a wide range between highest and lowest. The significance of the range in total cost and manufacturing labor cost is shown in Tables 5 and 6. Two plants produce 111,966.6 tons of pulp, or 15.4 per cent of the tonnage reported, at an average total cost of \$9.90 per ton; 7 plants produce 14.8 per cent of the total tonnage, at an average of \$13.48 per ton, that is to say, 37.1 per cent of the total reporting tonnage, or 269,247.5 tons, are produced at a figure under \$14 per ton as a total cost. Sixteen establishments produce 27.2 per cent of the tonnage, at an average of \$15.18 per ton and between the ranges of \$14 and \$16. The largest tonnage in a single group of costs falls between \$16 and \$20, with an average of \$17.18 per ton; this group of 22 plants out of 53, produces 246,989.9 tons, or 34.1 per cent of the total.

The manufacturing labor cost per ton of ground wood pulp ranges in the tables from 98 cents to \$5.90 per ton, 5.3 per cent of the tonnage being produced in one mill at the 98-cent cost; while only three-tenths of 1 per cent is produced at the highest figure. Both of these costs are therefore unusual in the industry. The table shows that the highest percentage of production falling into a single classified range of manufacturing labor cost falls in the \$1.50 and under \$2 group. Nearly 42 per cent (41.8) of the total tonnage reporting comes between these figures, and is produced at an average of \$1.69 per ton, while the average manufacturing labor cost for all is \$2.18 per ton; 50.8 per cent of the reported production carries a manufacturing labor cost of less than \$2 per ton; 18.6 per cent carries an average cost of \$2.33; 20.2 per cent an average cost of \$2.81, while 80.6 per cent of the total is produced at a cost for manufacturing labor ranging between \$1.50 as the lowest, and \$2.99 as the highest.

COST OF PRODUCTION OF SULPHITE PULP.

In the case of sulphite pulp there is likewise a wide range of cost, although not so great as in the case of ground wood. Here, too, the chief cause of variation in cost lies in the item of wood cost. The variation in the cost of wood alone is almost equal to that in the total

cost of pulp, and therefore goes far to account for the latter. The causes are the same as in the case of ground pulp. It should also be borne in mind that the variations in cost of wood per ton of product are influenced by the skill with which the raw material is utilized. In the case of ground wood pulp our figures show considerable variation in the quantity of wood entering into a ton of product, showing the effect of variations in the amount of waste. Similar variations appear in the cost of wood for sulphite mills, as determined by the skill employed in cooking.

The great divergence in the cost of labor per ton of sulphite is due principally to the difference in the size of the digesters used by the different companies. The capacity of a digester depends upon its size and cubical contents; but the labor required to handle the output of the digester is practically independent of its size. As a consequence, a digester of a given size will require practically the same amount of labor as one one-half its size, which will naturally result in the labor cost per ton of sulphite of the one being twice that of the other.

From the tables submitted it will be seen that 25 sulphite pulp mills in the United States from which reports were obtained produced an aggregate of 441,458.6 tons of chemical pulp during the period covered by the schedules; the total cost as carried on the books of the firms was \$14,122,691.84; the average total cost per ton being \$31.99. The average cost of wood as a raw material per ton of pulp was \$18.58; the manufacturing labor cost \$3.84, and the other costs, \$9.57, making, as stated, the total of \$31.99.

The range of costs as shown in the table, from highest to lowest is quite wide; wood costs ranging from \$13.28 per ton of pulp to \$25.89; labor costs from \$2.09¹ to \$6.51, and other costs from \$6.72 to \$14.68; total costs from \$24.47 to \$40.16.

The significance of this range is brought out in Table 6, which classifies the total cost by groups showing the percentage of the total in each group and the average by groups. That is to say, 8.5 per cent of the total production reported was produced at a total cost of between \$24 and \$26 per ton, the average for this group being \$24.47, while 15.3 per cent was produced at an average cost of \$28.93 per ton, 19.2 per cent at \$31.17, 29.7 per cent at an average of \$33.15,

¹ In order to analyze in detail the labor cost for mills producing at the lowest cost, a comparison has been made of two mills showing all labor charges for the lowest sulphite mill in Canada and the lowest in the United States.

Comparison and analysis of the lowest manufacturing labor costs per ton of sulphite pulp in the United States and Canada.

Departments of manufacture.	United States.	Canada.
Wood handling.....	\$0.30	\$0.20
Wood room.....	.23	.36
Acid plant.....	.17	.14
Digesters.....	.31	.21
Screens.....	.10	.05
Presses.....	.26	.50
Indoor labor, miscellaneous.....	.10	.08
Outdoor labor, miscellaneous.....	.12	.05
Foremen.....	.02	.11
Steam plant.....	.49	.16
Total manufacturing labor cost.....	2.09	1.86

21.5 per cent at \$34.89, while 5.8 per cent of the total was produced at an average total cost of \$37.14 per ton.

A study of the labor costs in the manufacture of chemical fiber or sulphite is interesting in respect to this question of range. Two plants have a manufacturing-labor cost under \$2.50 per ton, the average being \$2.26 per ton; these plants produce 7.9 per cent of the tonnage reported. Four plants have a labor cost ranging between \$2.75 and \$2.99, the average here being \$2.87, 16.1 per cent of the total tonnage reported being produced at this average rate and between the amounts named; 11.6 per cent of the tonnage was produced in three plants at a labor cost of between \$3 and \$3.49, the average being \$3.41; four plants produce 11.5 per cent of the reported tonnage at an average manufacturing labor cost of \$3.56 per ton, within the range indicated by \$3.50 to \$3.99; five plants produce 35.4 per cent of the reported tonnage at a labor cost ranging from \$4 to \$4.49, the average being \$4.15 per ton; four plants producing 11.3 per cent of the reported tonnage have a labor cost ranging from \$4.50 to \$4.99, with an average of \$4.71; three plants produce 6.2 per cent of the average of \$5.78 per ton, the average for the 25 plants and the total tonnage reported, i. e., 441,458.51 tons, is \$3.84 per ton.

COST OF PRODUCTION OF NEWS-PRINT PAPER.

Table 4 presents a summary of the cost of news-print paper in 38 mills in the United States, producing 940,475.1 tons of paper during the schedule period, at a total cost of \$30,921,400.33, or an average total cost of production of \$32.88 per ton. The lowest cost was in any one mill was \$24.50; the highest, \$43. The range in cost of ground-wood pulp per ton of finished paper is from \$3.25 to \$6.45, with an average for all of \$13.27; for sulphite pulp the range is \$6.45 as the lowest to \$14.12 for highest, the average being \$10.28; for all materials the average cost was \$22.74 per ton of paper, with a range of from \$15.64 to \$29.22.

The average cost of manufacturing labor is \$3.27 per ton of paper, the range being from \$2.19 to \$7.26. The significance of the wide ranges in costs is brought out in Tables 5 and 6, in which the establishments are classified by cost ranges and the percentage of production within each classification is shown.

For instance, the plant producing at the lowest cost of \$15.64 per ton produces but 4.8 per cent of the reported tonnage; any one plant produces at the highest rate, and its production is but a few tenths of 1 per cent of the reported tonnage. Four plants produce 18.1 per cent, at an average total cost of \$26.15; seven plants produce 210,215.7 tons, or 22.4 per cent of the reported tonnage, at an average cost of \$31.96; seven other plants produce 21.5 per cent of the total, at an average of \$34.07 per ton; while 25 of the 38 establishments produce 78.6 per cent of the reported tonnage below \$37.50; while 12 establishments produce 194,604.3 tons, or 20.7 per cent of the tonnage, at an average of \$38.31 per ton.

From Table 6 it will be seen that the higher manufacturing-labor costs represent but a small fraction of the total tonnage reported. The lowest average manufacturing-labor cost in the classified group is \$2.24,

and 9.9 per cent of the reported tonnage is produced at this cost for manufacturing labor; 31.6 per cent is produced at an average of \$2.84 per ton. That is to say, 41.5 per cent of the total is produced at considerably less than the average of the whole, while an additional 24 per cent is produced at an average of \$3.20, which is less than the average of the whole. An amount equal to 20.4 per cent of the total reported tonnage is produced at an average cost of manufacturing labor of \$3.65 per ton; 11.1 per cent at an average of \$4.22 per ton.

Taking the average of the manufacturing-labor cost for ground-wood pulp (\$2.18) and for sulphite pulp (\$3.84), and considering that paper uses 80 per cent of ground wood and 20 per cent of sulphite, the total manufacturing-labor cost from the rough wood to the finished paper would be \$5.782 per ton; that is to say, 80 per cent of \$2.18 is \$1.744, 20 per cent of \$3.84 is \$0.768, and these added to the \$3.27 labor cost in the paper itself gives a cost of manufacturing labor from rough wood to paper of \$5.782 on the average.

TABLE 7.—Average cost per ton of product for specified items entering into the cost of production of ground-wood pulp, sulphite fiber, and news-print paper for mills in the United States reporting data.

Items.	Average cost per ton of—		
	Ground wood.	Sulphite fiber.	News-print paper.
Wood.....	\$10.20	\$18.59	.....
Sulphur.....		3.21	.....
Lime and limestone.....		.60	.....
Ground wood.....			\$13.16
Sulphite.....			8.63
Waste paper.....			.79
Fillers.....			.40
Other materials.....			.42
Manufacturing labor.....	2.18	3.84	3.27
Pulp stones.....	.12		
Felts.....	.09	.16	.82
Wires.....	.04	.04	.36
Screen plates.....	.10	.09	.05
Beltting.....	.07	.13	.12
Lubricants.....	.05	.06	.08
Coal.....	.07	2.07	1.81
Wood.....		.17	.62
Finishing materials.....			.86
Other works expense.....	.27	.62	.69
Water power.....	.93	1.36	1.31
Repair materials.....	.57	1.18	.85
Repair labor.....	.38	.78	.55
Administration expense.....	.36	.39	.45
Miscellaneous operating expense.....	.27	.21	.26
Accident insurance.....	.03	.04	.03
Fire insurance.....	.06	.07	.07
Taxes.....	1.24	1.25	1.26

¹ Water-power costs reported by 8 establishments with tonnage of 204,340.8.

² Includes electric power in 3 mills having 13 per cent of the total product.

³ Mills with 42.8 per cent of total production report fire insurance, accident insurance, and taxes combined.

⁴ Mills with 28.3 per cent of total production report fire insurance, accident insurance, and taxes combined.

⁵ Mills with 38 per cent of total production report fire insurance, accident insurance, and taxes combined.

Table 7 gives the average cost of production in greater detail than is attempted in former tables. Elements of cost are here itemized and the average for all mills from which such items were secured is given.

In the table the three commodities, ground wood pulp, sulphite pulp, and news-print paper, have been put in separate columns on

the same page. All the items in the list do not apply to each of the articles produced; but it is believed that by leaving the lines blank when the item does not apply there need be no confusion. For instance, pulp stones are an item of cost in ground wood only; sulphur, lime, and limestone are used in sulphite pulp only; wood is of course used only in making pulp.

In most cases the average costs in this table are made up of the whole volume of the given material used in all plants, and hence is a true average cost. In one or two mills, however, certain items were not secured and hence these items in this table were worked out on a tonnage different from the total of tonnage used in the other tables. In each case, however, the difference was slight, and these average costs by item may be accepted as indicating very closely the practices in the industry.

In the case of water power charged, on ground wood pulp for instance, only 8 concerns make such a charge, and these rent their water power. The water power charged by these 8 mills was divided by the tonnage produced by these mills, so that this is a true average where water power is rented.

One difficulty arises in the case of lime cost in sulphite pulp. Some plants use lime only, others limestone only, while a few used both during the schedule year. Limestone costs less, but more of it is required than of lime; and since some plants used both, it seemed statistically possible only to show the average cost of the lime element in sulphite pulp regardless of how it was secured; that is, whether secured from lime or limestone.

Practically no other difficulties arose, so that with these explanations in mind the table can be safely used as indicated.

PART IV. CANADIAN INVESTIGATION.

COST OF PRODUCTION OF PULP AND NEWS-PRINT PAPER IN CANADA

The schedules received by the board from Canada cover 13 ground-wood pulp mills, producing 305,699.4 tons of pulp, at a total cost of \$2,922,222.99. Of this amount 144,886.7 tons were produced for consumption in the same plant, and were run in "slush" state to the paper mills. Seven plants produced 160,812.7 tons in "lapped," or pressed condition, for sale on the market as ground-wood pulp. Schedules were secured from 5 sulphite pulp mills producing 75,588 tons of fiber at a total cost of \$1,999,860.51.

Reports were secured from 7 news-print paper mills carrying 159,437.6 tons of paper, produced at a total cost of \$4,389,567.18.

In most instances the Canadian schedules covered a year's business for the mill reporting, but in some cases the schedule period was for less than a year, and in these cases the data were reduced to a 12-month basis for purposes of uniformity. The relative importance of the schedules thus scaled up to a 12-month period was slight, only small mills being affected.

Tables embodying the information for Canadian mills have been revised to include new schedules received since the publication of the first report. Certain errors, not important in themselves, crept into the former statement owing to the fact that some of the Canadian data used were received only a few hours before the completion of the first report. These tables as revised are presented here consecutively to make possible a discussion of the facts they contain in a single statement. These tables correspond in form and matter with those prepared for the mills in the United States.

TABLE 8.—*Summary of the cost of manufacture of ground-wood pulp, sulphite fiber, and news-print paper, showing total cost, highest, lowest, and average cost per ton of product, by specified items of cost, for mills in Canada reporting data.*

Items.	Total cost.	Range of cost per ton of products.		Average.
		Lowest.	Highest.	
Ground-wood pulp:¹				
Slush pulp—				
Wood.....	\$848,367.03	\$4.09	\$9.62	\$5.86
Labor.....	228,026.00	1.11	2.18	1.57
Other costs.....	229,017.10	.76	2.29	1.58
Total.....	1,305,410.13	7.37	13.98	9.01
Finished pulp—				
Wood.....	895,107.51	4.26	6.99	5.56
Labor.....	299,468.14	1.55	2.29	1.86
Other costs.....	422,237.21	2.01	3.68	2.63
Total cost in bulk at works.....	1,616,812.86	8.96	10.93	10.05
Slush and finished combined:				
Wood.....	1,743,474.54	4.26	9.62	5.70
Manufacturing labor.....	527,494.14	1.11	2.29	1.73
Other costs.....	651,254.31	.76	3.68	2.13
Total.....	2,922,222.99	7.37	13.98	9.56

¹ For mills having 2 per cent of the total tonnage, data were secured for nine months only, and for mills having 23 per cent of the total tonnage data were secured for a shorter period. These mills have been raised to a 12-months basis.

TABLE 8.—Summary of the cost of manufacture of ground-wood pulp, sulphite fiber, and news-print paper, showing total cost, highest, lowest, and average cost per ton of product, by specified items of cost for mills in Canada reporting data—Continued.

Items.	Total cost.	Range of cost per ton of products.		Average.
		Lowest.	Highest.	
Sulphite fiber: ¹				
Wood.....	\$991,566.18	\$11.75	\$19.66	\$13.13
Labor.....	242,986.21	1.86	4.71	3.21
Other costs.....	765,308.12	8.47	12.23	10.13
Total cost in bulk at works.....	1,999,860.51	24.02	33.34	26.47
News-print paper: ²				
Materials—				
Ground-wood pulp.....	1,354,044.98	6.16	9.93	8.49
Sulphite pulp.....	1,180,688.88	5.28	9.29	7.41
Other materials.....	157,170.27	.61	4.03	.99
Total materials.....	2,691,904.12	13.10	19.55	16.89
Manufacturing labor.....	508,387.75	2.72	3.59	3.19
Other costs.....	1,189,275.31	6.31	9.46	7.45
Total cost in bulk at works.....	4,389,567.18	24.97	30.18	27.53

¹ For mills having 45 per cent of the total tonnage, data were secured for nine months only. These mills have been raised to a 12-months basis.

² For mills having 2 per cent of the total tonnage, data were secured for nine months only, and for mills having 13 per cent of the total tonnage, data were secured for a shorter period. These mills have been raised to a 12-months basis.

TABLE 9.—Cost of production of ground-wood pulp, sulphite fiber, and news-print paper in Canada, by classified rates of cost per ton for mills reporting data.

Cost per ton.	Number of establishments.	Total tons produced.	Per cent of total tons produced.	Average cost per tons produced.
Ground wood: ¹				
Blush pulp—				
\$7 and under \$9.....	2	52,116.0	36.0	\$7.65
\$9 and under \$10.....	2	68,904.0	47.6	9.54
\$10 and under \$12.....	1	21,420.0	14.8	10.04
\$12 and under \$14.....	1	2,446.7	1.7	13.98
Total.....	6	144,886.7	100.0	9.01
Finished pulp—				
\$7 and under \$9.....	1	26,248.0	16.3	8.96
\$9 and under \$10.....	3	36,720.0	22.8	9.44
\$10 and under \$12.....	3	97,844.7	60.9	10.53
Total.....	7	160,812.7	100.0	10.05
Blush and finished pulp—				
\$7 and under \$9.....	3	78,364.0	25.6	8.08
\$9 and under \$10.....	5	105,624.0	34.6	9.51
\$10 and under \$12.....	4	119,264.7	39.0	10.48
\$12 or over.....	1	2,446.7	.8	13.98
Total.....	13	305,699.4	100.0	9.56
Sulphite pulp: ²				
\$24 and under \$26.....	3	49,596.0	55.0	24.54
\$26 and under \$30.....	1	27,821.0	36.8	27.69
\$32 and under \$34.....	1	6,171.0	8.2	33.84
Total.....	5	75,588.0	100.0	26.47
News-print paper: ³				
Under \$25.....	1	6,962.4	4.4	24.97
\$25 and under \$30.....	5	123,935.3	77.7	27.06
\$30 or over.....	1	28,539.9	17.9	30.18
Total.....	7	159,437.6	100.0	27.53

¹ For mills having 2 per cent of the total tonnage data were secured for 9 months only, and for mills having 23 per cent of the total tonnage data were secured for a shorter period. These mills have been raised to a 12-month basis.

² For mills having 45 per cent of the total tonnage data were secured for 9 months only. These mills have been raised to a 12-month basis.

³ For mills having 2 per cent of the total tonnage data were secured for 9 months only, and for mills having 13 per cent of the total tonnage data were secured for a shorter period. These mills have been raised to a 12-month basis.

TABLE 10.—*Manufacturing labor cost per ton of ground-wood pulp, sulphite fiber, and news-print paper, by classified rates for mills in Canada reporting data.*

Labor cost per ton of product.	Number of establishments.	Tons produced.	Per cent of total tons produced.	Average cost per ton.
Ground-wood pulp:¹				
Slush pulp—				
\$1 and under \$1.50.....	2	71,616.0	49.4	1.83
\$1.50 and under \$2.....	3	70,824.0	48.9	1.60
\$2 and under \$2.50.....	1	2,446.7	1.7	2.18
Total.....	6	144,886.7	100.0	1.57
Finished pulp—				
\$1.50 and under \$2.....	4	81,069.0	50.4	1.62
\$2 and under \$2.50.....	3	79,743.7	49.6	2.11
Total.....	7	160,812.7	100.0	1.86
Slush and finished combined—				
\$1 and under \$1.50.....	2	71,616.0	23.4	1.33
\$1.50 and under \$2.....	7	151,893.0	49.7	1.70
\$2 and under \$2.50.....	4	82,190.4	26.9	2.11
Total.....	13	305,699.4	100.0	1.73
Sulphite fiber:²				
Under \$2.50.....	1	6,250.0	8.3	1.80
\$2.50 and under \$3.....	1	24,636.0	32.6	2.92
\$3 and under \$3.50.....	2	38,531.0	61.0	3.38
\$4.50 and under \$5.....	1	6,171.0	8.1	4.71
Total.....	5	75,588.0	100.0	3.21
News-print paper:³				
Under \$3.....	5	87,185.6	54.7	2.95
\$3 and under \$3.50.....	1	15,000.0	9.4	3.04
\$3.50 and under \$4.....	1	57,252.0	35.9	3.59
Total.....	7	159,437.6	100.0	3.19

¹ For mills having 2 per cent of the total tonnage data were secured for 9 months only, and for mills having 23 per cent of the total tonnage data were secured for a shorter period. These mills have been raised to a 12-month basis.

² For mills having 45 per cent of the total tonnage data were secured for 9 months only. These mills have been raised to a 12-month basis.

³ For mills having 2 per cent of the total tonnage data were secured for 9 months only, and for mills having 13 per cent of the total tonnage data were secured for a shorter period. These mills have been raised to a 12-month basis.

COST OF PRODUCTION OF GROUND-WOOD PULP IN CANADA.

In the discussion of costs which follows, the total costs aside from material have been termed conversion costs, though the minor items of taxes and insurance, which are not strictly conversion costs, are included under this heading.

In Canada the distinction between slushed and finished pulp is so important that the data have been segregated upon this basis. Slush pulp is used where made, and can not be exported or sold as such. Hence, for purposes of ascertaining and comparing the cost of Canadian pulp as a marketable commodity, purchasable in this country, with domestic pulp, it is necessary to consider finished pulp as a separate proposition.

The tables show that 160,812.7 tons of finished, marketable pulp were produced in seven establishments at a total cost of \$1,616,812.86, or an average of \$10.05 per ton, though 60.9 per cent of it was produced at an average cost of \$10.58 per ton and 16.3 per cent at the lowest cost of \$8.96. Slushed pulp for use in the mills where made

was produced at an average of \$9.01, or \$1.04 per ton less on the average than finished pulp. Taking all ground-wood pulp produced, we have a tonnage of 305,699.4, at a total average cost of \$9.56 per ton, with a highest total cost of \$13.98 and a lowest of \$7.37. The lowest cost for wood per ton of pulp was \$4.26 and the highest \$9.62, with an average of \$5.70, making the total conversion costs only for ground-wood pulp in Canada \$3.86 per ton, as against \$4.36 in the United States. The significance of the range in total cost is brought out in Table 9, which shows 25.6 per cent produced at an average of \$8.08, 34.6 per cent at an average of \$9.51, while 39 per cent, or 119,264.7 tons, were produced at an average total cost of \$10.48.

The cost of manufacturing labor was, when averaged over the whole production, \$1.73 per ton of pulp, the range being from \$1.11 to \$2.29. Two plants produced 23.4 per cent of the reported tonnage at an average manufacturing labor cost of \$1.33 per ton, seven establishments produced 49.7 per cent at an average of \$1.70, while four establishments produced 26.9 per cent at an average of \$2.11. The highest group was, therefore, 7 cents lower in their manufacturing labor cost than the average for all mills in the United States.

COST OF PRODUCTION OF SULPHITE FIBER IN CANADA.

The tables of cost of sulphite pulp in Canada cover a production of 75,588 tons, manufactured at a total cost of \$1,999,860.51, or an average of \$26.47 per ton. The lowest cost is \$24.02 and the highest \$33.84. The volume of production at the highest rate is small, being 6,171 tons, or 8.2 per cent of the total tonnage reported, while 55 per cent of the reported production is at an average of \$24.54, and 36.8 per cent was produced at an average of \$27.69. The cost of the wood as a raw material was \$13.13 per ton of pulp on the average, with a lowest and highest ranging from \$11.75 to \$19.66 per ton. Deducting the wood, there remains \$13.44 as the cost of conversion, if sulphur, which is a conversion material, be included. On the same basis, deducting wood, the conversion cost in the United States on the average is \$13.41, or 3 cents per ton less than in Canada, although the average manufacturing labor cost shows 63 cents per ton higher in the United States than in Canada.

The manufacturing labor cost in sulphite ranges from \$1.86 to \$4.71 per ton, with an average of \$3.21. One plant operates at the lowest labor cost and it produces 8.3 per cent of the reported tonnage. Fifty-one per cent is produced at an average of \$3.38 per ton for manufacturing labor, while 8.1 per cent is produced at the highest reported cost of \$4.71.

COST OF PRODUCTION OF NEWS-PRINT PAPER IN CANADA.

The seven news-print paper establishments from which reports were secured produced 159,437.6 tons of news-print paper at a cost of \$4,389,567.18, or an average of \$27.53 per ton. The range is from \$24.97 as lowest, to \$30.18 as highest cost. A very small percentage—4.4 per cent—was produced at the lowest cost, while 17.9 per cent was produced at the highest, leaving five establishments, producing 123,935.3 tons, or 77.7 per cent, at an average

of \$27.06. Stock materials averaged \$16.89 per ton, leaving \$10.65 as the conversion cost for paper in Canada as against \$10.14 as a total conversion cost of paper (excluding stock materials) in the United States, on the average a difference of 51 cents per ton in favor of the United States. The cost of stock materials in the United States averaged \$22.74 per ton of paper for all mills reporting, a difference of \$5.85 per ton of paper in favor of Canadian mills.

Manufacturing labor costs range from \$2.72 to \$3.59 per ton of paper, with an average for the whole of \$3.19. Five establishments, producing 54.7 per cent of the tonnage, did so at an average cost for manufacturing labor of \$2.95, while 35.9 per cent of the tonnage carried a manufacturing labor cost of \$3.59.

PART V.

COMPARISON OF COSTS IN THE UNITED STATES AND CANADA.

Coming now to the matter of comparison of costs for ground-wood pulp, sulphite fiber, and news-print paper between the United States and Canada, the elements of such costs are brought together in the following table:

TABLE 11.—*Summary of the cost of ground-wood pulp, sulphite fiber, and news-print paper, showing lowest, highest, and average cost per ton of product, by specified items of cost for mills, in the United States and Canada reporting data.*

Items.	Lowest cost per ton of product.		Highest cost per ton of product.		Average cost per ton of product.	
	United States.	Canada.	United States.	Canada.	United States.	Canada.
Ground-wood pulp:						
Wood.....	\$6.90	\$4.26	\$13.33	\$9.62	\$10.33	\$5.70
Manufacturing labor.....	.53	1.11	5.90	2.29	2.13	1.73
Other costs.....	.30	.70	6.83	3.68	2.13	2.13
Total cost in bulk at works.....	9.80	7.37	21.32	13.98	14.59	9.56
Sulphite fiber:						
Wood.....	13.28	11.75	25.69	19.66	18.59	13.13
Manufacturing labor.....	2.09	1.86	6.51	4.71	3.84	3.21
Other costs.....	6.72	8.47	14.68	12.23	9.57	10.13
Total cost in bulk at works.....	24.47	24.02	40.16	33.84	31.99	26.47
News-print paper:						
Ground-wood pulp.....	8.26	6.16	18.54	9.93	13.27	8.49
Sulphite fiber.....	6.45	5.23	14.12	9.29	8.63	7.41
Other materials.....	.32	.61	3.25	4.03	.84	.99
Total materials.....	14.64	13.10	29.22	19.55	22.74	16.89
Manufacturing labor.....	2.19	2.72	7.26	3.59	3.27	3.19
Other costs.....	4.63	6.31	10.05	9.46	6.87	7.45
Total cost in bulk at works.....	24.50	24.97	43.00	30.18	32.88	27.53

¹ The present tables of highest and lowest cost per ton of product for the United States and Canada show certain apparent discrepancies as compared with the tables printed in the preliminary report. These discrepancies may need explanation.

Where the lowest given in the present table is lower than that as previously published, or the highest figure in the present report is higher than that previously published, this is naturally accounted for by the inclusion in the present report of mills which had not been reported at the time of the previous publication.

In some cases, however, the figures as now printed give as the lowest a figure higher than the previous lowest, or a highest cost lower than the previous highest cost. This may be accounted for in various ways. For instance, in the column for news-print paper, the lowest cost per ton of paper now appears slightly higher for both ground-wood pulp and sulphite pulp in the United States, the reason being that in the new tabulation the figures were revised on an absolutely uniform basis, and in this particular case the company had charged all of its overhead expenses to the cost of the paper alone and none to its pulp plants. This overhead expense was distributed over the three plants, thus raising the amount for pulp and reducing the item of other costs on the paper.

In the highest cost per ton of product for the United States in the case of ground-wood pulp, the former figure of \$15.01 has been reduced to \$13.33. This is accounted for by the fact that the report from the mill in question showed an amount of pulp entirely impossible in relation to the amount of wood charged in. In this case they were credited with an additional amount of pulp, thereby reducing the cost of wood per ton of pulp.

Similar readjustments have been made in some cases for Canadian mills, which accounts for certain similar changes in the Canadian column. In the preliminary report, because of the fact that adequate time was not allowed for a minute examination of Canadian figures, some figures were included which for the extreme "high" and "low" needed careful revision. In one case there was an actual misprint. Under the head of "News-print paper" the lowest Canadian cost for sulphite pulp per ton of paper was given as \$3.71. This appears correctly in the new table as \$5.23.

² For mills having 2 per cent of the total tonnage, data were received for 9 months only. For mills having 23 per cent of total tonnage, data were received for a shorter period. These mills have been raised to a 12-months basis.

³ For mills having 45 per cent of the total tonnage, data were secured for 9 months only. These mills have been raised to a 12-months basis.

⁴ For mills having 2 per cent of total tonnage, data were secured for 9 months only. For mills having 13 per cent of total tonnage, data were secured for a shorter period. These mills have been raised to a 12-months basis.

Some discussion of its findings has been had incidental to the other Canadian tables, so that no more than a summary seems necessary here. Ignoring the highest and lowest, the significance of which can be determined by reference to the classified cost tables for both countries, the total average cost for the two countries present some interesting comparisons. The first thing that seems significant is that the difference in cost of wood per ton of pulp is practically the difference in the total cost. For instance, in ground-wood pulp the total cost is \$14.59 for the United States and \$9.56 for Canada, a difference of \$5.03. The cost of the wood as raw material per ton of product is \$10.23 for the United States and \$5.70 for Canada, a difference of \$4.53, which deducted from the total difference of \$5.03 leaves a difference of 50 cents per ton in favor of Canada, 44 cents of this being in the item of manufacturing labor cost.

The Canadian average cost for sulphite was \$26.47, the average for the United States mills reporting was \$31.99, a difference of \$5.52, of which \$5.45 is absorbed by the difference in cost of wood as a raw material, leaving a net difference of but 6 cents per ton, although the difference in labor cost is 63 cents per ton in favor of Canada.

In news-print paper the effect of wood cost is not so clear, because here the raw material is pulp and not wood, but if we take 80 per cent of the difference we find in the wood cost in ground-wood pulp, and 20 per cent of the difference in case of sulphite pulp, we have \$4.71 as the amount of the difference in the cost of news-print paper in the two countries, which is due to the difference in wood costs.

The average cost of production of news print in Canada is \$27.53 per ton, in the United States \$32.88. The difference is \$5.35, of which \$4.71 is accounted for by difference in cost of wood as raw material in the pulp, leaving a difference of 64 cents, only 8 cents of which is covered by the difference in manufacturing labor.

Table 12 corresponds to Table 7, page 32, only as concerns news-print paper, giving the average cost for all mills by principal items of cost. The column showing the same facts for mills in the United States has been transferred to this table also for purposes of more minute comparison.

TABLE 12.—Average cost per ton of product for specified items entering into the cost of manufacture of news-print paper, for mills in Canada and the United States reporting data.

Items.	Average cost per ton of news-print paper.	
	Canada.	United States.
Ground wood.....	\$3.49	\$13.27
Sulphite.....	7.41	8.63
Waste paper.....	1.24	.79
Fillers.....	.40	.40
Other materials.....	.57	.42
Total materials.....	16.89	22.74
Manufacturing labor.....	3.19	3.27
Felts.....	.79	.82
Wires.....	.33	.36
Screen plates.....	.03	.05
Belting.....	.10	.12
Lubricants.....	.08	.08
Coal.....	2.13	1.81
Wood.....	.16	.52
Finishing materials.....	1.50	.86
Other works expense.....	.24	.69
Water power.....	.30	1.31
Repair materials.....	.52	.85
Repair labor.....	.55	.55
Administration expense.....	.49	.45
Miscellaneous operating expense.....	.66	.26
Accident insurance.....	.03	.03
Fire insurance.....	.16	.07
Taxes.....	.09	1.26

¹ Includes electric power in three mills having 13 per cent of the total product.

² Mills with 38 per cent of total production report fire insurance, accident insurance, and taxes combined.

PART VI.

INTERMEDIATE PROFITS AND COST OF WOOD.

A bookkeeping practice quite general in recent years, and by no means confined to the pulp and paper industry, is to run each department of a plant or of a company as a separate entity and conduct it on a paying basis precisely as though it were a separate industry. Thus the pulp mill attached to a paper mill is run for a profit precisely as much as though it were run to manufacture pulp for the open market. Wood operations are conducted to show a profit to themselves, and the pulp mill pays the wood-land department either the market price or nearly that for its wood, charges the paper mill the market price for pulp, etc. In some instances even supplies are purchased by a store-room department, which resells to the mill at a profit. Subsidiary companies are operated to sell to the parent company. In one case a subsidiary was organized to take over the water power, and thereafter the pulp and paper company paid some \$70,000 a year for water power that had formerly been considered a part of capital investment. This added \$1.75 per ton to the book cost of pulp, while the paper mill also paid a tribute of 12 cents per ton to the water company in addition to the increased cost of the pulp it used. In a few other cases electric power had been segregated and put under a subsidiary company, which sold it at a profit to the pulp and paper mills. This gives to the finished product a cost which it would carry in the case of a separate paper mill buying all its pulps and materials in the open market; but it gives a cost of paper lined with a string of profits on materials to concerns producing their own material.

The total of these profits on material in process can, of course, be deducted by a sufficiently careful study of the schedules, and this has been done for the vital processes. The difficulty in any general statement is that all manufacturers do not charge a profit on material in process, but put the pulp they themselves produce into the paper mill at its net cost; for instance, in the United States in the total of 940,478.1 tons of news-print paper covered by this report there were 482,967.4 tons, or 51.4 per cent, in which the ground-wood pulp made and used in the same plants was charged into the paper mills at a profit above the cost of manufacture. The average profit on the pulp so charged was \$2.68 per ton of pulp, and this made a ground-wood profit of \$1.74 per ton of paper produced, which will here be designated as a "profit cost," or cost which results from profits on material in stages of process. On the other hand, 349,877.7 tons of paper, or 37.2 per cent of the paper reported, carried a profit on the sulphite pulp made and used in the same plant. The average of the profit of sulphite pulp so charged was \$2.23 per ton of pulp, resulting in 65 cents per ton of paper.

It is manifestly unfair to average these pulp profits over all of the paper production, since the cost of only 37.2 per cent of the reported output is enhanced by profits on transfer of sulphite pulp, and 51.4 per cent is enhanced by profits on transfer of ground wood pulp, while nearly half of paper produced does not carry a cost so enhanced.

On the other hand, companies which do not charge a profit on material in process in the same establishment do charge where the pulp mills are entirely distinct and at a distance from the paper mill consuming the pulp. One of the largest concerns, for instance, charges ground-wood pulp shipped from mill to mill at a uniform flat price of \$17 per ton, the purchasing mill to pay the freight cost of the transfer. To some pulp mills this is a profit, to some an actual loss. The profit on ground wood transfers for 1909 for the company in consideration was \$60,000, on a transfer of 106,000 tons of pulp, or less than 60 cents per ton of pulp so transferred. This would mean a pulp wood profit of 48 cents per ton of such paper as was made from the pulp transfer, but this was only a trifle over one-third of the paper tonnage produced by the concern in question. To distribute it over all tonnage, even within the same corporation, would be to apply to 66 per cent of its product a cost it does not carry and relieve 33 per cent of a "profit cost" it does carry. The board has endeavored to locate rather than distribute this "profit cost," believing that since it is not general it should not be anywhere considered as such.

In Canada in 54.4 per cent of the total tonnage of news-print paper reported, the ground wood pulp was charged into the paper mills at a profit above the cost of manufacture. The average profit per ton of ground wood pulp so charged was \$1.90 and the "profit cost" per ton of paper was \$1.52. In 36.3 per cent of the total tonnage of Canadian news-print paper reported, the sulphite pulp was charged into the paper mills at a profit above the cost of manufacture. The average profit per ton of sulphite pulp was \$3.98 and the profit cost per ton of paper was 79 cents.

WOOD PROFIT AND STUMPAGE IN GROUND-WOOD PULP.

Most of the manufacturers of pulp and paper have protected their supply of raw material by more or less extensive investments in woodlands. As a rule the woodland account is credited with a "stumpage" or price per cord for the standing trees, in the price charged to the pulp mills. Not all concerns, however, put a stumpage charge into the price of the wood so charged. "Stumpage" was charged into the cost of the wood that produced 572,561 tons out of the 725,254 tons of ground-wood pulp covered by the report. In other words, 78.9 per cent of the ground-wood pulp carries a stumpage profit. The lowest stumpage cost per ton of ground-wood pulp was \$0.51 on 6,003 tons of pulp; the highest stumpage cost was \$2.48 on 38,499 tons; the average stumpage on the 572,561 tons which carried stumpage cost was \$1.16 per ton.

In addition to stumpage charge, which is, as stated, simply setting a value on the standing wood, there were a number of companies and firms which made a profit on woodland operations as such; that is, a profit on the cost of getting the wood from the forest to the mill.

Of the 725,254 tons of ground-wood pulp covered by the schedules secured 494,689 tons, or 68.2 per cent, carried a profit cost on wood—lands operation over and above stumpage. The highest profit so charged was \$1.96 per ton of pulp. This, however, affected but 8,532 tons; the lowest was \$0.12, carried by 22,264 tons; the average profit cost carried by the entire 494,689 tons affected was \$1.10 per ton.

WOOD PROFIT AND STUMPAGE IN SULPHITE PULP.

The foregoing statement deals solely with ground-wood or mechanical pulp. The same conditions exist in the case of the wood used for sulphite pulp.

The schedules secured from 25 sulphite mills in the United States carried a total production of 441,459 tons; of this 339,787 tons carried a stumpage charge on the wood used in its production. The average stumpage was \$2.13 per ton of sulphite pulp, the range being from \$0.99 as the lowest to \$4.93 for the highest. The lowest figure applies to 12,638 tons; the highest to 17,422 tons.

A profit on woodland operations, in excess of or other than the amount charged as stumpage, was carried by 177,801 tons out of the 441,459 tons of sulphite reported. That is, 40.2 per cent of the tonnage carried a "profit cost" in the wood used for its production, the lowest being \$0.39, on 9,425 tons, and the highest \$2.76, on 125,023 tons, the average of such profit cost carried by the 177,801 tons being \$2.14 per ton.

Profit here must be understood to mean not only profit above stumpage on lands owned by the paper company, or a subsidiary, but also the profits on a large amount of wood bought in the open market either by the firm direct or more often by a subsidiary company and resold to the parent company or to the pulp mill at a profit on the original purchase price.

LOGGING OPERATIONS AND PULP WOOD COSTS.

Below is given a table summarizing the examination of the board into logging operations in connection with wood costs to pulp mills. These figures have been carefully compiled from the detailed cost records of woodland operations. As may be seen from a footnote below (p. 46), exact comparison is very difficult on account not only of the division of wood into rough, peeled, and rossed, but also on account of the variations as to the amount of wood in a cord and the number of pounds of wood to a ton of pulp.

TABLE 13.—Lowest, highest, and average price (per cord), stumpage (per cord), and profit (per cord) of rough, peeled, and rossed wood purchased and cut from lands owned by mills, for ground-wood and sulphite mills in the United States reporting data.

GROUND-WOOD MILLS.

	Cords used.	Price per cord at mill.	Stumpage per cord.	Profit per cord.
<i>Purchased wood.</i>				
Rough:				
Lowest.....	¹ 3,999	\$6.00	.....	None.
Highest.....	² 3,507	9.25	.....	\$1.05
Average.....	³ 81,988	6.87	.....	.04
Peeled:				
Lowest.....	¹ 2,904	9.91	.....	None.
Highest.....	² 9,848	10.09	.....	1.60
Average.....	³ 12,752	9.96	.....	1.16
Rossed:				
Lowest.....	¹ 5,715	9.03	.....	None.
Highest.....	² 6,029	15.01	.....	2.00
Average.....	³ 221,934	11.50	.....	1.60
<i>Wood cut from own land.</i>				
Rough:				
Lowest.....	¹ 46,690	7.38	None.	None.
Highest.....	² 6,174	8.84	\$2.00	1.46
Average.....	³ 154,820	7.65	1.47	.06
Peeled:				
Lowest.....	¹ 5,934	8.01	None.	None.
Highest.....	² 14,386	11.37	2.85	.44
Average.....	³ 67,839	9.96	2.02	.09
Rossed:				
Lowest.....	¹ 106,861	11.29	None.	.13
Highest.....	² 20,309	14.00	2.50	1.46
Average.....	³ 141,250	11.68	2.13	1.27

SULPHITE MILLS.

<i>Purchased wood.</i>				
Rough:				
Lowest.....	¹ 59,801	\$4.82	.....	None.
Highest.....	² 38,761	7.82	.....	\$0.75
Average.....	³ 193,394	6.29	.....	.16
Peeled:				
Lowest.....	¹ 10,173	7.89	.....	None.
Highest.....	² 18,293	10.35	.....	.20
Average.....	³ 28,466	9.47	.....	.13
Rossed:				
Lowest.....	¹ 19,851	10.75	.....	None.
Highest.....	² 5,556	11.55	.....	1.46
Average.....	³ 143,471	10.99	.....	1.44
<i>Wood cut from own land.</i>				
Rough:				
Lowest.....	¹ 21,036	7.70	None.	None.
Highest.....	² 11,007	9.40	\$2.00	None.
Average.....	³ 80,951	7.95	1.30	None.
Peeled:				
Lowest.....	¹ 30,124	9.52	1.00	None.
Highest.....	² 19,790	10.56	2.85	None.
Average.....	³ 266,905	9.87	1.30	None.
Rossed:				
Lowest.....	¹ 106,861	11.29	.85	None.
Highest.....	² 16,793	12.00	2.065	None.
Average.....	³ 127,246	11.42	1.84	None.

¹ Number of cords at lowest price per cord.² Number of cords at highest price per cord.³ Total number of cords on which average is based.

CORDS OF PULP WOOD USED IN CANADIAN MILLS.

The number of cords of pulp wood used in Canada during the year 1909, together with its average value per cord¹ at the mill and the number of tons of ground wood, sulphite, sulphate, and soda pulps manufactured from it in Canada, have been ascertained by the forestry branch of the Dominion Government for all but about 10 mills, and the results are presented in its Bulletin No. 12, from which the following has been compiled:

¹ An order in council of the government of the Province of Quebec, dated Apr. 26, 1910, for the regulation of licenses to cut timber from the Crown woods and forests, reaffirmed the previous order fixing the contents of a cord of wood as follows:

"For the purpose of applying the present tariff to cord wood, the English cord of 128 cubic feet is equivalent to 600 feet b. m. for rough or unbarked wood and to 700 feet b. m. for rossed or peeled wood." It has been ascertained, however, that there has never been any scientific or accurate basis used in fixing the equivalent of the cord of 128 cubic feet at 600 feet b. m. for rough or unbarked wood. A number of Canadian and American manufacturers have made practical tests for the purpose of establishing the number of feet in a cord of rough spruce pulp wood. The tests in widely separated concerns showed that a cord of 128 cubic feet contained not to exceed 500 feet b. m.

In some establishments the tests gave from 450 to 471 feet per cord.

As many manufacturers of ground wood pulp and sulphite in the United States and Canada charge into their cost sheets the rough wood they use on the basis of 600 feet per cord, it will be seen that in all such cases they have the benefit of 100 feet per cord and a fictitious increase in the cost of wood to that extent. As the logs from which the pulp wood is made are cut, driven, boomed, and measured on the basis of the number of feet board measure they contained, it is interesting to find that there is no such thing as a uniform log rule used for the purpose of measurement in Canada or the United States.

In the Canadian Forestry Journal for December, 1910, is an article by A. H. D. Ross, M. A., M. F., lecturer in the faculty of forestry in the University of Toronto, urging the forestry association to consider the possibility of a uniform log rule for all Canada. He says:

"Up to the present time no less than 54 different rules have been devised for the purpose of estimating the contents of logs of given diameters and lengths. Some 46 of these may be described as board measure rules and the remaining 8 as volume rules. The board measure rules profess to give the number of board feet of inch lumber that may be sawn from logs of given dimensions and the volume rules give a more or less accurate estimate of the cubic contents of the logs. * * * Of the 46 board measure rules, 17 may be described as formula rules, 17 as diagram rules, 8 as mill tallies, and 4 combination rules. * * *

With such a welter of rules—many of which are grossly inaccurate and no two of which agree—is it any wonder that there is a widespread desire for the adoption of a universal standard of measurement?"

Inasmuch as the comparative cost of news-print paper and pulp in the United States and Canada is governed almost entirely by the cost in each country of the cord of wood, it would seem to be of the greatest importance that an accurate knowledge of the volume of wood inside the bark should be known, but excepting in those establishments which have made accurate tests, the actual contents are not known. Then, too, the quantity of wood in a cord differs on account of different dimensions. In a paper read by Herbert N. Price, president Province of Quebec Pulp Wood Association, before the Canadian Forestry Convention at Ottawa in 1906, he said:

"There is no doubt but that a smaller diameter of wood has been cut than is in the true interests of the pulp and paper mill to accept or the owner of the private lands or limits to cut. Some 12 years since the diameter shipped (to the United States) was 6 inches and up, while now 4 inches and up is accepted. The actual quantity of wood is less in a cord of 4 inches and up than in 6 inches and up, but competition between buyers have brought about this lower minimum. * * * Pulp wood is divided into rough wood, peeled wood, hand-shaved wood, and rossed wood. Rough wood is made generally in the winter in whatever lengths are most convenient, being cut down to 4 feet before being shipped to the United States and to 2 feet. If trees are cut after winter sets in, they can be hand peeled to advantage the following spring, as the sap will then run. Peeled wood is peeled in the woods in June, July, and August and mostly cut in 4-foot lengths and hauled out the following winter or driven the following spring. Hand-peeled wood is generally peeled with a drawknife the following spring and summer, after being made rough in the woods and after being either hauled, cut, or driven. The later in the summer it is so hand peeled the harder the work is. Rossed wood is the rough wood machine-peeled by a barker or rosser. The loss of wood in this case is greater than when it is hand peeled and may be estimated at from 20 to 30 per cent, according to the size and quality. The smaller the diameter of the wood, the greater the waste or loss. The number of pieces in a cord varies greatly according to the size of the wood cut, but from actual measurement a cord averaging 4½ inches in diameter takes 174 pieces; 5½ inches, 122 pieces; 6½ inches, 100 pieces; and 7½ inches, 82 pieces, showing the extra labor and handling in cutting small wood. In shipping wood by rail it is found that a cord of wood peeled in summer and shipped the following winter or spring weighs about 3,800 pounds per cord.

"The values of spruce pulp wood have gone up greatly during the past 10 years and especially within the last 5 years (prior to 1906). Rough wood that sold at \$2.50 a cord, 6 inches and up, in 1892, sold in 1904 at \$4.50 for 4 inches. The Quebec Government stumpage of 65 cents per cord, 600 feet b. m., is equal to 91 cents per 1,000 feet."

TABLE 14.—*Number of cords of wood used, average value per cord, and number of tons of pulp produced in Canadian mills in 1909.*

[Data for 10 mills were not received.]

Provinces.	Cords of wood used.	Average value per cord.	Tons of pulp produced.
Quebec.....	319,935	\$5.83	238,280
Ontario.....	187,352	5.72	132,391
New Brunswick.....	88,350	4.69	41,991
Nova Scotia.....	25,676	4.07	23,966
British Columbia.....	1,316	7.44	644
Total.....	622,129	5.57	445,408

Five hundred and sixteen thousand and thirty cords, or 82.9 per cent, was spruce and 100,095 cords, or 16.1 per cent, was balsam, the two woods being 99 per cent of all the wood used.

During the year the mills investigated by the board got out or purchased for their own use 476,278 cords of rough pulp wood at an average cost of \$5.76 per cord. Most of this was landed at the mills in the log drive by water; but some had been transported by rail to the plant.

In the production of the output reported, 395,127 cords of rough wood were used.

The following table shows the number of cords at each of the range of costs per cord.

This table also shows that 77.3 per cent of all the wood used cost less than \$6 per cord.

TABLE 15.—*Costs of rough spruce wood at Canadian mills.*

Range of costs per cord.	Cords.	Per cent of total.
Less than \$5 per cord.....	10,080	2.5
\$5 and over but under \$6.....	295,153	74.8
\$6 and over but under \$7.....	66,375	16.8
\$7 and over but under \$8.....		
\$8 and over but under \$9.....	121,927	5.5
\$9 and over but under \$10.....		
\$10 and over but under \$11.....	11,502	0.4
Total.....	395,127	100.0

¹ Include wood shipped by rail.

² Rossed wood.

PART VII.

POUNDS OF MATERIAL PER TON OF NEWS-PRINT PAPER.

Stock material in news-print paper consists of ground-wood pulp, sulphite fiber, clay, alum, sizing, color, and occasionally waste paper. The principal stock materials are, of course, the pulps, and in the table which will follow these are shown separately, all other materials are included in the total but are not itemized. Where waste paper was purchased from the outside it was considered in the cost of material and included in pounds of material used. In some cases the waste paper was not an expense and hence was ignored. In the few cases where the total weight of materials used is less than a ton, there has been bad estimating of the amount of pulp used by the firm, or there has been an unscheduled amount of waste paper used, or both, and this is also true where the total material is less than or only slightly over 2,000 pounds per ton of product, as in establishment 1.

The proportion of sulphite fiber to ground-wood pulp, or to total ingredients, will be seen to vary greatly, and this is true in practice, for where the mechanical or ground-wood pulp is of a poor quality it requires more sulphite pulp to bind or "mat" it. Mechanical pulps bought on the market are not as a rule so carefully ground nor so closely screened as pulps made by a concern for its own use, and hence more sulphite pulp is required. During the past two or three years the water supply on most of our rivers has been very unsatisfactory, most American paper mills have been forced to buy pulp, or at least make an inferior pulp themselves, and the use of sulphite fiber has been correspondingly large. To illustrate, one paper manufacturer stated that when water was plenty he could, by using high-grade sulphite and screening his ground-wood pulp thoroughly, make a good paper with 13 per cent sulphite; while with purchased ground wood he had used 30 per cent sulphite to get an equally good paper. The figures show that the average used during last year was practically 25 per cent, whereas 20 per cent is the usually estimated proportion. The average ground-wood pulp used per ton of news-print paper produced in the 38 mills in the United States was 1,573.8 pounds, the average of sulphite pulp 507 pounds, the total average of material per ton of paper was 2,199.8. In Canada the average for 7 mills was 1,565 pounds of ground wood, 506 pounds of sulphite fiber, and a total average of all material of 2,141 pounds per ton of paper.

POUNDS OF MATERIAL IN FINISHED PRODUCT.

To understand the illusiveness of this problem, it should be stated that while wood is bought on some fairly specific basis of measurement and the number of cords in the wood pile is known with some accuracy, the wood is not measured regularly into the wood room, but

only estimated—estimated with care, to be sure, but nevertheless estimated. The wood when barked is transformed into pulp by going through the grinders, or in case of sulphite pulp, through the digesters.

In most cases the pulp is carried in a flood of water to the screens, thence to the "stuff chests," or storage vats, from there to the paper machines, always in a flowing slush of water and pulp. It is not weighed into the paper-making machines; it is never possible under any circumstances to do so. When pulp is run through wet machines and packed for shipment or sale, it is never dry, nor more than 65 per cent dry; usually pulp is shipped and sold 50 per cent wet.

Nevertheless, in all estimates of production and of use, pulp is considered on an air-dry basis—that is to say, on the basis of "bone dry," plus 10 per cent. This assumes all of the moisture out of it as "bone dry"; then 10 per cent is added as the amount of moisture it would absorb from the atmosphere. All pulps and papers are figured on this basis. In other words, these weights are carried on the books, and all computations are made on pulp and paper in a condition in which the pulp is never actually found.

In no case where a rough cord of wood is estimated to produce 1,600 or 1,800 pounds of air-dry pulp is the cord of wood measured into the grinders and the pulp caught and rendered air dry and weighed. Nowhere in the industry is there any such weighing in and weighing out as there is in the iron and steel industry, for instance. The pulp can not be weighed onto the Fourdrinier, either air dry or in any other condition, and yet an estimate is made of the amount of pulp "air dry" which is running onto the machine. These estimates are honestly made, based on the experience of the manufacturer, as a means of getting as nearly as possible at his cost of production.

Secondly, this pulp is figured on an air-dry basis, which is, as before stated, bone-dry plus 10 per cent. The paper is actually weighed off the machine. By the time this pulp runs over 25 or 30 hot steel rollers, it is more than air-dry; it is nearly bone dry. Hence to say that 111 pounds of material figured as air dry shows a waste or loss of stock of 11 pounds per hundred is incorrect, because the 10 per cent difference between the air-dry estimate of pulp weight and the almost bone-dry weight of finished paper absorbs most of the 11 pounds and renders the actual stock loss comparatively little. Of course, in some instances there is a good deal more than 11 pounds, and in these cases there is either bad estimating on the pulp actually used or there is excessive stock loss.

STOCK LOSS.

So far as stock loss in this country is concerned, certain facts are to be considered. The difference between the air-dry pulp and the almost bone-dry paper has already been discussed. It remains to discuss the economy of such saving as has been suggested. The stock loss on sulphite pulp is comparatively nil—not over 1 or 2 per cent. The stock loss on ground-wood pulp consists of the fine powdery matter that has been so reduced by the grinders that no wires we use on paper machines will hold it while it "mats" with the other pulps. Being practically powdered it has no "matting" qualities. This goes off as "white water." If this were distilled in "save-alls" the

result would be a wood flour which could only serve as a "filler," not as a real pulp. It would, in short, only effect a saving on clay and the other fillers. An equipment to save it costs money, the labor to operate the equipment is comparatively high-priced labor; and it might even result that the so-called waste if saved would cost more than the filler that it would displace and operate to increase the labor cost per ton of paper. The American rate of wages is so high that labor must be employed only on exceedingly productive lines. Sometimes it costs more to save waste materials than it does to lose them. To illustrate: In Norway and Sweden pyrites is used instead of sulphur in making sulphite pulp. The saving there on the Swedish wage basis is 25 per cent of the sulphur cost. Our sulphur cost in a ton of sulphite pulp is \$3—25 per cent of this is 75 cents; one-fifth of a ton of sulphite pulp goes in a ton of paper, or 15 cents per ton of paper. But the original expense of pyrites burners is considerable, and the labor of burning it at the American rate of wages would so far exceed the Swedish that it is quite possible that to attempt to economize by using pyrites instead of sulphur would increase the cost of paper in the United States. It may be well to note, however, that in an estimate made for the board by a construction engineer whose business is principally that of building pulp and paper mills he calculates a reduction of 30 cents per ton of news-print paper. This, however, assumes easy access to pyrites supplies. His statement follows:

The substitution of sulphur burning by the burning of pyrites would increase the cost of construction per ton of finished paper for a 50-ton news-print-paper mill about \$400 per ton; a 100-ton news-print-paper mill about \$300 per ton, and a 200-ton news-print-paper mill about \$275 per ton. The advantage to be attained through the burning of pyrites in place of sulphur is a reduction in the cost of the manufacture of the sulphite pulp, safely \$1.50 per ton of production, showing on the ton of news-print paper a saving of one-fifth of \$1.50, or 30 cents per ton.

The statement of the saving in Swedish mills was made to the board by a Swedish paper manufacturer visiting America, and the statement was very positive that the saving was 25 per cent. Only one sulphite mill has tried to install pyrites burners, so far as known, and in this case the experiment was abandoned.

Some stock losses we undoubtedly have, some wastefulness of materials that could be saved. Some of the most advanced manufacturers are attempting to improve their plants in this regard, but in view of the high cost of equipment and labor it is still a question whether or not this will prove a genuine economy.

TABLE 16.— *Pounds of ground wood pulp, of sulphite fiber, and of all materials used per ton of news-print paper in mills in the United States and Canada, by mills.*

UNITED STATES.

Mill No.	Material per ton of news-print paper.			Mill No.	Material per ton of news-print paper.		
	Ground wood.	Sulphite.	All materials.		Ground wood.	Sulphite.	All materials.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
1.....	1,520	381	2,002	21.....	1,700	496	2,232
2.....	1,384	640	2,117	22.....	1,492	382	2,104
3.....	1,572	630	2,311	23.....	1,480	407	1,990
4.....	1,586	532	2,241	24.....	1,684	316	2,118
5.....	1,649	502	2,203	25.....	1,769	400	2,196
6.....	1,582	490	2,181	26.....	1,526	643	2,235
7.....	1,536	668	2,233	27.....	1,620	493	2,264
8.....	1,476	525	2,251	28.....	1,616	431	2,176
9.....	1,664	576	2,387	29.....	1,601	442	2,177
10.....	1,409	450	2,195	30.....	1,530	459	2,132
11.....	1,592	551	2,224	31.....	1,589	387	2,093
12.....	1,562	521	2,184	32.....	1,658	468	2,275
13.....	1,587	449	2,136	33.....	1,472	406	2,060
14.....	1,612	479	2,193	34.....	1,614	359	2,106
15.....	1,246	954	2,270	35.....	1,784	415	2,343
16.....	1,718	442	2,248	36.....	1,623	463	2,233
17.....	1,317	448	1,996	37.....	1,514	519	2,193
18.....	1,453	434	1,966	38.....	1,661	462	2,248
19.....	1,565	435	2,062				
20.....	1,795	447	2,249				
				Average.....	1,573.8	507	2,199.8

CANADA.

1.....	1,567	580	2,192	6.....	1,672	453	2,172
2.....	1,406	304	2,141	7.....	1,622	416	2,119
3.....	1,568	549	2,190	Average.....	1,565	506	2,141
4.....	1,598	488	2,165				
5.....	1,538	534	2,116				

PART VIII.

EFFICIENCY OF EQUIPMENT IN PAPER MILLS IN THE UNITED STATES AND CANADA.

That labor efficiency and labor cost per ton of product are almost entirely dependent upon equipment is evidenced by the following table, which deals with Fourdrinier paper machine cost only. It will be understood that the liquid pulp runs from the mixing vats, or from the "stuff chests," upon the wires of the Fourdrinier where it is "matted" and carried in continuous sheet over the felts through the machine to the reels, where it is wound on a roll as finished paper. The employees who operate these machines are the highly skilled labor in a paper mill. It is these paper machines (called Fourdrinier's from the name of the man who patented their general idea) which control the final question of efficiency of equipment. In the following table 14 machines are taken from three plants, include all machines in these plants and represent practically all types of machines in use. Efficiency is studied on the basis of the speed and capacity of machines, the tonnage capacity of the machines in 24 hours, and the number of men required to man the machine; from this is derived the total one-man hours on each machine each day (of 24 hours) and the time cost in one-man hours per ton of product, and finally the machine labor cost per ton of paper produced. It will be seen that the time cost ranges from 2.64 hours of labor per ton to 6.3 hours—one-man time; the money cost from 82 cents to \$1.84 per ton, and in the same plant the cost is as high as \$1.84 per ton on one machine and as low as 98 cents on another. It is the difference between this newer equipment and higher labor efficiency and lower cost, or on the contrary, old and slow machines and high cost, that spells profits or loss in the paper business.

TABLE 17.—*Efficiency of labor by paper machines of given sizes and capacities.*

Machine No.—	Width of wire.	Width of trimmed roll.	Speed per minute.	Capacity in 24 hours.	Men to machine.	One-man hours.	Time cost per ton.	Fourdrinier machine labor cost per—	
								Machine hour.	Ton.
	<i>Inches.</i>	<i>Inches.</i>	<i>Feet.</i>	<i>Tons.</i>			<i>Hours.</i>		
1.....	86	76	519	21	4½	108	5.15	\$1.34	\$1.53
2.....	86	73½	459	17	4½	108	6.3	1.30	1.84
3.....	86	76	465	18	4½	108	6.0	1.30	1.73
4.....	92	84	462	19	4½	108	5.69	1.31	1.65
5.....	108	100	451	25	5	120	4.8	1.47	1.41
6.....	122	113	447	27	5	120	4.45	1.49	1.32
7.....	145	136	485	36	5	120	3.33	1.54	1.06
8.....	152	140	527	41	5½	132	3.22	1.68	.98
9.....	152	140	527	41	5½	132	3.22	1.68	.98
10.....	166	158	570	50	5½	132	2.64	1.70	.82
11.....	158	150	570	50	5½	132	2.64	1.70	.82
12.....	88	80	575	25	4	96	3.84	1.20	1.15
13.....	116	108	585	35	5½	132	3.77	1.59	1.09
14.....	148	140	585	46	5½	132	2.87	1.62	.88

In view of the foregoing, it becomes important to glance at the equipment of plants with a view to studying, first, the comparative efficiency of those in the United States with those of Canada and then comparative efficiency of machines within the United States. Most of the Canadian mills are new. The Fourdrinier, or paper machine, being the key to capacity and efficiency in a paper mill, has been taken as the standard by which to judge of efficiency of equipment. These machines are analyzed in the following table by capacity of machines, by speed as expressed by feet per minute, by width of trimmed roll, and by number of years since installed. For Canadian machines the facts are stated in simple averages or percentages for all machines.

The American machines are shown, first, by simple averages and percentages as is done with Canadian machines; second, in three groups. Group A represents 56 per cent of all the American machines reported by the 38 paper mills reporting. Group B represents 44 per cent of all machines reported. Group C consists of the machines in five of the best paper mills in the United States so located as to be near the belt of competition with Canadian mills, and forming a natural subdivision or grouping of American mills.

The division between Group A and Group B was made primarily to show the proportion of American machines (Fourdriniers) superior or inferior to the Canadian average. While the basis of the table is the machine (Fourdrinier) rather than the mill or plant, yet the inadvisability of separating the machines in a mill (for, after all, the mill is the industrial unit of which the machine is the efficiency measure) became apparent. Hence, each group represents mills as wholes, even though one or more machines might be found in a mill, which as machines might entitle them to different grouping.

TABLE 18.—*News-print-paper machine equipment in the United States and Canada.*

	Canadian mills reporting.	American mills reporting.			
		All mills.	A (56 per cent of all machines).	B (44 per cent of all machines).	C (5 best mills).
Capacity of machines:					
Average in 24 hours.....tons..	31.0	27.8	32.4	22.2	40.0
Greatest in 24 hours.....do....	50.0	50.0	50.0	41.0	50.0
Least in 24 hours.....do.....	10.0	5.0	5.0	12.0	25.0
Per cent 40 tons and over.....	18.7	17.0	27.3	3.8	45.5
Per cent 30 tons and over.....	62.5	41.5	63.6	13.5	86.4
Per cent 15 tons and under.....	6.2	11.9	9.1	16.4	0.0
Speed of machines per minute:					
Average number of feet of paper.....	480.0	465.6	499.3	422.7	537.0
Per cent 500 feet and over.....	68.7	38.1	57.6	13.5	90.9
Per cent less than 400 feet.....	6.2	20.3	10.6	32.6	0.0
Width of rolls, trimmed:					
Average number of inches.....	121.0	109.9	119.2	98.1	140.0
Per cent with rolls 120 inches and over.....	62.5	34.7	48.5	17.3	84.4
Per cent with rolls less than 100 inches.....	12.5	36.4	25.8	50.0	13.6
Years installed					
Average number of years installed.....	7.2	12.7	10.0	16.6	8.1
Per cent of machines installed 15 to 30 years.....	6.2	34.7	13.6	61.5	9.1
Per cent machines of American manufacture.....	100.0	100.0	100.0	100.0	100.0

The Fourdrinier machines in both countries were all manufactured in the United States. In the matter of capacity per machine in 24 hours the Canadian machines show an average of 31 tons; the average of all American machines reported is 27.8 tons; those in Group A, 32.4 tons; Group B, 22.2 tons; while the average per machine in the best mills, or Group C, is 40 tons of paper per machine each 24 hours.

In Canada, 18.7 per cent of all machines have a productive capacity of 40 tons or over per day of 24 hours. In the United States 17 per cent of the machines, taken as a whole, have similar capacity. In Group A, 27.3 per cent; in Group B, 3.8 per cent; while in Group C, 45.5 per cent of all machines have a capacity of 40 tons or over. Taking as a basis machines with a capacity for production of 30 tons or over per day, we find that 62.5 per cent of all Canadian mills reporting fall within this class, while 41.5 per cent of all American machines, 63.6 per cent of the machines in Group A, 13.5 per cent of those in Group B, and 86.4 per cent of those in Group C come within this classification.

If we look now for the smaller machines, of 15 tons and under, Canada has 6.2 per cent; the United States, taking all machines reported, has 11.9 per cent; Group A has 9.1 per cent; Group B, 15.4 per cent, while in the best mills none at all are found.

By speed of machines in feet per minute is meant the number of feet of paper in a sheet the width of the roll that will pass through the machine and come out in a finished condition in one minute. To say that a machine has a width of trimmed roll of 140 inches and a speed of 500 feet per minute is to say that a continuous sheet of paper 140 inches wide is coming out of the machine at the rate of 500 feet a minute. Of course, this width of trim and speed in feet per minute determines the daily tonnage capacity of the Fourdrinier machine.

The average speed in feet per minute of all reporting Canadian machines was 480 feet; of all reporting American machines 465.6 feet. The average for Group A is 499.3 feet; for Group B, 422.7 feet; and for the machines found in the five best mills 537 feet per minute.

In Canada 68.7 per cent of all reported machines have a speed rate of 500 feet or over per minute; in the United States 38.1 per cent; in Group A, 57.6 per cent; in Group B, 13.5 per cent of machines have such speed rate, while in the best American mills 90.9 per cent of the machines come within this classification. The percentage of machines having a speed of less than 400 feet a minute is 6.2 for Canada; 20.3 per cent for the United States as a whole; 10.6 per cent for Group A; 32.6 per cent for Group B; while none are found in Group C.

The meaning of width of trimmed roll has been explained. The average width for Canadian mills is 121 inches; for all American mills, 109.9 inches; for Group A, 119.2 inches; for Group B, 98.1 inches; while for Group C it is 140 inches. In Canada 62.5 per cent of all machines reporting have a width of trimmed roll 120 inches and over; in the United States 34.7 per cent fall within this classification; in Group A, 48.5 per cent; Group B, 17.3 per cent; while in the best mills 86.4 per cent of the machines have a width of roll 120 inches and over.

Coming to the narrow rolls—less than 100 inches wide—we find this classification covers 12.5 per cent of Canadian machines, 36.4 per cent of all reporting American machines, 25.8 per cent of all machines in Group A, 50 per cent of machines in Group B, and 13.6 per cent of Group C. Canadian machines have been installed an average of 7.2 years; the average for the United States is 12.7 years; for Group A, 10 years; Group B, 16.6 years; while in Group C, 8.1 years. In Canada 6.2 per cent of machines have been installed from 15 to 30 years; in the United States this percentage is 34.7; in Group A, 13.6 per cent; in Group B, 61.5 per cent; in Group C, 9.1 per cent.

To the question, then, how far American mills are on an equal basis for competition with the Canadian mills in the matter of equipment.

the answer seems to be that the total average of equipment and efficiency is slightly better for Canada than for the United States; that Group C, of domestic machines (five best mills), shows greatly superior efficiency to the Canadian in all essential features; that Group A (56 per cent of all machines reported) shows practical equality with the efficiency of equipment in Canada; while Group B (44 per cent of all machines reported) presents a condition which would force them, if obliged to meet really extensive competition from Canada, greatly to curtail other expenses, or greatly increase investment for improvement of equipment, or shift to other kinds of paper.

These reflections presume, of course, an equally efficient labor force on both sides of the line. On this point the report of the representative of the board engaged in collecting the statistics for Canada is submitted:

EFFICIENCY OF LABOR IN CANADA.

Canadian paper and pulp mills are equipped, as a rule, with the latest and most improved machines made by American manufacturers in the United States.

The general managers and superintendents are, for the most part, Americans of wide experience. Those who are Canadians by birth are men who, like the Americans, have had long years of training in American paper and pulp mills. The skilled men, the machine tenders, and other hands who operate the paper machines are, as a rule, Americans brought from the United States for the purpose. They are paid American rates of wages, although in several instances the rates are for a 12-hour shift, instead of for an 8-hour shift, as in Eastern United States. Excepting for the comparatively small number of skilled men necessary to operate the paper machines and the mechanics employed on repairs, the great majority of the men employed in the paper and pulp mills are classed as unskilled, and receive the pay of unskilled laborers. A study of the comparative wage tables in the report shows that the average rates of pay of unskilled men are lower in Canada than in the United States. For detailed figures see wage statistics in Part XIII.

It would seem then that with modern mills, American machinery, American-trained managers and superintendents, and American skilled operatives, together with lower rates of wages for unskilled men, the Canadian manufacturing labor cost per unit of production in the modern and well-equipped mills of Canada would be considerably lower than in the modern and well-equipped mills of the United States.

The tables show, however, that the Canadian labor cost per ton of news-print paper is only slightly lower on the average. That 41.5 per cent of the tonnage reported in the United States carries a manufacturing labor cost of less than \$3 per ton, while 54.7 per cent in Canada falls under \$3. The total average for the United States is \$3.27 as against \$3.19 in Canada, notwithstanding Canada's advantage in average equipment. This indicates that there is greater efficiency and experience in the first-class mills of the United States.

With the exception of the machine tenders the labor employed in Canadian mills is French-Canadian. The mass of French-Canadians have been workers on the farm and in the forests and almost entirely out of touch with industrial life in shops, mills, or factories.

They have had no opportunity for systematic training in manufacturing establishments and Canadian mill managers do not seem to realize that the men in the log pond, the log deck, the barking room, the grinders, the wet machines, and the numerous other unskilled positions are just as essential in their required places for the manufacture of paper as the skilled paper-machine tenders. Close inquiry of managers, superintendents, and foremen elicited uniform statements that the French-Canadians transferred from the farm and forests were not as yet dependable or efficient. They had not, it was stated, as yet acquired the degree of responsibility essential in every position and subdivision in the process of manufacture nor the close and undivided attention to duty required.

It was further affirmed by managers that this irresponsibility extended to those who were placed in the position of minor foremen. The answer to the statements of the inefficiency of the French-Canadian laborers was the pointing out of numerous instances of efficiency of a high order in the higher grades of employment. It is charged that American-trained superintendents give preference to Americans in the skilled positions and that no opportunity has been afforded to French-Canadians to advance and it was pointed out that where strikes occurred and the French-Canadian given a chance he had succeeded.

In a few establishments, in consequence of strikes or threatened strikes by Americans, a policy of training French-Canadians in the skilled occupations has been adopted. At present the high labor cost per ton is owing largely to the fact that the Canadian unskilled laborers do not accomplish as much per man as the laborers in the American mills. This is, however, a matter which in time would correct itself, and it is hardly to be doubted, with an incentive to acquire industrial training and skill and the necessity on the part of manufacturers for imparting such skill, the Canadian paper manufacturers will ultimately train the French-Canadian labor to the point where the manufacturers will reap the full fruit of their best equipments.

The longer and colder winters in Canada also add much to the labor cost, more men being required to handle the frozen lap pulp and other materials; the outdoor movements of men and animals being impeded for a longer time by the frost and snow.

The effect of the long and severe winter is shown in the following labor cost per ton of news-print paper each month during the summer and winter months in a Canadian mill:

Month of year.	Wages paid per ton of paper.	Month of year.	Wages paid per ton of paper.
April, 1910.....	\$3.25	September, 1910.....	\$3.38
May, 1910.....	3.54	October, 1910.....	4.45
June, 1910.....	3.60	November, 1910.....	4.22
July, 1910.....	3.76	December, 1910.....	5.10
August, 1910.....	3.43	January, 1911.....	5.33

These figures represent the total pay-roll cost, not merely manufacturing labor cost. That is to say, all repair and upkeep and all other labor is in this statement of wages per ton of paper. It must not, therefore, be compared with manufacturing labor costs as shown on paper in the tables of cost.

PART IX.

PRICES OF NEWS-PRINT PAPER.

The price of news-print paper to the consumer differs according to the distance from the mill. The country may be divided roughly into five zones, each subject to a distinct price quotation. These zones are as follows:

(1) Eastern, including the territory from the Canadian border to the Potomac and from the Atlantic Ocean as far west as Buffalo and Pittsburg. It includes the New England States, New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia. Within this zone the freight rate for paper does not exceed 18 cents per 100 pounds, and the price within this territory is quoted, as a rule, irrespective of the distance of any particular point from the mill. Prices are practically the same for the seven largest cities; namely, New York, Boston, Philadelphia, Baltimore, Washington, Pittsburg, and Buffalo. In the smaller towns in the same territory the prices are somewhat higher, owing to the fact that the orders are smaller, the papers in those towns having a much smaller circulation. The smaller papers in New York City are largely supplied by jobbers and are charged prices substantially the same as those paid by the papers in the smaller towns purchasing direct from the paper mills.

(2) Middle Western or Ohio zone: This includes the States of Ohio, Indiana, Illinois, and the city of St. Louis, Mo.

Michigan though geographically belonging to the same group stands by itself in the matter of paper prices. Owing to its own mills and its proximity to the Canadian border it enjoys a freight rate lower even than many points in the Eastern States, and prices in that territory are therefore somewhat different from those in the other States.

(3) Southern zone, including the States of North Carolina, South Carolina, Georgia, Alabama, Florida, Mississippi, Louisiana, and Tennessee. The prices in this territory differ considerably according to distance and the size and desirability of the contract.

(4) The Pacific coast.

(5) States between the Mississippi River and the Rocky Mountains, and the Southwestern States. Most of the papers in this territory have a small circulation, and as a rule buy their paper in sheets from jobbers in Chicago, but few of them being supplied with paper rolls from mills. Prices in this territory are therefore higher than in the others and show a great variation.

The following tables show the course of prices in various centers of the United States. The figures were obtained from the original contracts on file in the offices of the various paper mills examined by the board, and represent in each case the highest, lowest, and average price in each commercial center for the corresponding year. In analyzing the prices of the different mills it has been found that they

naturally fall in two groups, the prices in each group being sufficiently uniform to represent a distinct set of price quotations. The relative importance of each group will be seen from the tons of paper sold by each.

TABLE 19.—*Prices of news-print paper in the eastern territory charged by mills in Group I.*

Years.	Boston.			
	Tons.	Price per ton.		
		Lowest.	Highest.	Average.
1898.....	8,000	\$35.00	\$35.00	\$35.00
1899.....	8,000	35.00	35.00	35.00
1900.....	8,000	35.00	35.00	35.00
1901.....	6,850	40.00	47.60	43.78
1902.....	9,040	40.00	50.00	42.02
1903.....	17,999	42.00	52.00	45.50
1904.....	25,229	43.00	53.40	47.33
1905.....	14,671	38.00	55.00	41.77
1906.....	14,608	38.00	55.00	40.82
1907.....	31,655	38.00	51.00	40.17
1908.....	36,595	40.00	55.00	45.15
1909.....	69,199	42.00	55.00	42.67
1910.....	9,965	45.00	48.00	45.09
1911.....	25,509	43.20	48.00	43.80

Years.	New York.				Philadelphia.			
	Tons.	Price per ton.			Tons.	Price per ton.		
		Lowest.	Highest.	Average.		Lowest.	Highest.	Average.
1898.....	100	\$37.50	\$37.50	\$37.50				
1899.....	16,800	37.50	42.50	41.18				
1900.....	34,531	35.00	57.00	40.47	5,730	\$45.40	\$45.40	\$45.40
1901.....	50,719	35.00	57.00	41.45	50,400	40.00	47.50	42.53
1902.....	25,430	35.00	50.00	39.90	26,290	40.00	47.50	40.34
1903.....	32,493	35.00	52.00	42.06	29,244	40.00	47.50	43.51
1904.....	27,411	35.00	53.00	41.38	17,476	44.00	47.50	44.19
1905.....	30,458	37.60	53.00	42.21	5,469	41.00	47.00	44.06
1906.....	30,368	37.00	50.00	38.46	2,936	41.00	44.00	43.12
1907.....	38,063	38.00	52.00	41.53	5,375	40.00	49.00	43.77
1908.....	48,923	38.00	55.00	45.91	54,450	41.00	45.00	41.68
1909.....	40,209	38.00	50.00	42.88	13,500	45.00	45.00	45.00
1910.....	29,471	44.20	50.00	45.06	24,700	45.00	51.00	45.78
1911.....	127,229	43.20	50.00	44.51	3,000	45.00	45.00	45.00

Years.	Baltimore.				Washington.			
	Tons.	Price per ton.			Tons.	Price per ton.		
		Lowest.	Highest.	Average.		Lowest.	Highest.	Average.
1900.....					1,031	\$42.00	\$45.00	\$42.38
1901.....	200	\$47.00	\$47.00	\$47.00	1,929	42.00	50.00	44.05
1902.....	547	45.00	47.50	45.03	1,375	45.00	48.00	45.82
1903.....	2,556	45.00	48.00	45.29	1,638	45.00	50.00	46.25
1904.....	2,983	44.00	50.00	45.62	3,684	44.00	50.00	46.47
1905.....	4,506	40.00	48.00	43.04	4,371	38.00	50.00	42.38
1906.....	8,973	38.00	47.00	39.13	3,925	38.00	48.00	40.22
1907.....	7,451	38.00	47.00	38.76	3,975	38.00	50.00	41.38
1908.....	7,240	45.00	52.00	49.27	6,552	45.00	54.00	49.33
1909.....	8,600	45.00	45.00	45.00	6,585	45.00	50.00	45.06
1910.....	6,500	45.00	45.00	45.00	7,285	45.00	48.00	45.03
1911.....	11,000	45.00	45.00	45.00	6,085	45.00	48.00	45.04

TABLE 19.—*Prices of news-print paper in the eastern territory charged by mills in Group I—Continued.*

Years.	Pittsburg.				Buffalo.			
	Tons.	Price per ton.			Tons.	Price per ton.		
		Lowest.	Highest.	Average.		Lowest.	Highest.	Average.
1898.....								
1899.....								
1900.....	2,242	\$42.50	\$50.00	\$46.47	800	\$46.00	\$50.00	\$48.75
1901.....	6,596	40.00	50.00	41.88	5,800	43.00	50.00	45.64
1902.....	7,623	40.00	47.50	41.90	2,580	43.00	46.00	43.00
1903.....	4,055	44.00	52.00	44.29	5,300	44.00	44.00	44.00
1904.....	13,758	43.00	52.00	43.85	4,650	44.00	47.00	44.22
1905.....	29,610	42.00	50.00	42.62	10,050	38.00	45.00	43.14
1906.....	23,479	38.00	47.00	39.47	5,650	38.00	45.00	39.45
1907.....	20,026	40.00	55.00	40.33	3,325	40.00	43.00	40.89
1908.....	19,533	44.00	55.00	44.18	9,050	45.00	52.00	49.60
1909.....	19,447	44.00	52.00	44.10	4,750	45.00	47.00	45.16
1910.....	28,862	44.00	52.00	44.59	1,525	45.00	45.00	45.00
1911.....	24,925	40.00	52.00	43.23	325	45.00	45.00	45.00
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Years.	Summary for the seven cities.				Summary all other eastern cities.			
	Tons.	Price per ton.			Tons.	Price per ton.		
		Lowest.	Highest.	Average.		Lowest.	Highest.	Average.
1898.....	8,100	\$35.00	\$37.50	\$35.03				
1899.....	24,800	35.00	42.50	39.18				
1900.....	52,334	35.00	57.00	40.59	3,888	\$43.00	\$60.00	\$46.38
1901.....	122,494	35.00	57.00	42.30	25,910	40.00	60.00	46.26
1902.....	72,885	35.00	50.00	40.80	21,952	40.00	60.00	44.64
1903.....	93,285	35.00	52.00	43.55	35,365	40.00	58.00	46.01
1904.....	65,191	35.00	53.40	44.35	32,306	44.00	58.00	46.61
1905.....	99,355	37.00	55.00	42.72	42,905	37.00	58.00	44.16
1906.....	89,339	37.00	55.00	39.47	33,819	37.00	55.00	42.27
1907.....	104,870	38.00	55.00	40.78	37,794	37.00	60.00	43.03
1908.....	182,343	38.00	55.00	44.75	43,971	40.00	60.00	48.96
1909.....	162,290	38.00	55.00	43.38	35,310	39.80	57.00	45.13
1910.....	108,308	44.00	52.00	45.10	30,598	42.80	55.00	45.14
1911.....	198,133	40.00	52.00	44.31	22,005	45.00	55.00	45.39

TABLE 20.—*Prices of news-print paper in the eastern territory charged by mills in Group II.*

Years.	New York.				Boston, New York, Philadelphia, Baltimore, and Washington combined.			
	Tons.	Price per ton.			Tons.	Price per ton.		
		Lowest.	Highest.	Weighted average.		Lowest.	Highest.	Weighted average.
1901.....	15,201	\$34.00	\$45.00	\$34.44	20,835	\$34.00	\$45.00	\$35.85
1902.....	47,487	34.00	45.00	34.54	69,879	34.00	45.00	35.69
1903.....	51,629	34.00	48.00	35.15	60,645	34.00	48.00	35.91
1904.....	47,525	34.00	48.00	35.27	92,410	34.00	48.00	37.98
1905.....	59,145	34.00	46.00	36.16	80,216	34.00	46.00	37.68
1906.....	100,304	34.00	42.00	36.67	146,417	34.00	42.00	36.78
1907.....	76,366	37.00	50.00	37.72	87,169	37.00	50.00	38.03
1908.....	76,160	37.00	50.00	37.74	116,726	37.00	50.00	39.97
1909.....	79,129	37.00	46.00	38.38	116,008	37.00	47.00	39.74
1910.....	99,447	37.00	45.00	39.40	136,395	37.00	45.00	40.32
1911.....	22,201	41.80	45.00	43.78	24,801	41.80	45.00	43.90

TABLE 21.—*Prices of news-print paper in Middle Western cities and in New Orleans charged by mills in Group I.*

Years.	Chicago.				St. Louis.			
	Tons.	Price per ton.			Tons.	Price per ton.		
		Lowest.	Highest.	Average.		Lowest.	Highest.	Average.
1900.....	881	\$37.50	\$50.00	\$40.64				
1901.....	5,093	37.50	50.00	44.01	11,500	\$42.50	\$42.50	\$42.50
1902.....	3,913	37.50	47.00	44.03	16,362	41.00	42.50	41.88
1903.....	1,859	45.00	50.00	47.05	7,838	41.00	46.00	42.75
1904.....	491	46.20	48.00	46.98	12,250	42.50	46.00	43.55
1905.....	45,350	41.00	48.00	41.81	21,150	40.40	46.00	41.93
1906.....	61,295	40.00	42.00	40.02	3,000	40.00	42.00	41.00
1907.....	61,589	40.00	47.00	40.87				
1908.....	76,462	42.00	52.00	42.46	2,000	50.00	50.00	50.00
1909.....	49,210	42.00	50.00	42.09	3,000	45.00	45.00	45.00
1910.....	10,547	42.00	48.00	43.75	18,527	45.00	47.00	45.00
1911.....	99,599	43.20	46.00	43.91	6,083	45.00	47.00	45.02

Years.	Indianapolis.				Cincinnati.			
	Tons.	Price per ton.			Tons.	Price per ton.		
		Lowest.	Highest.	Average.		Lowest.	Highest.	Average.
1900.....					2,100	\$40.00	\$45.00	\$42.38
1901.....					5,157	40.00	52.50	42.94
1902.....					11,638	39.60	52.50	40.19
1903.....	636	\$45.00	\$48.00	\$45.25	11,608	39.60	49.00	41.88
1904.....	640	45.00	48.00	45.94	8,595	39.60	49.00	42.63
1905.....	344	40.00	48.00	45.03	8,817	41.00	48.50	41.80
1906.....	240	40.00	42.50	40.86	8,450	40.00	47.00	40.34
1907.....					8,719	41.00	50.00	41.86
1908.....	1,200	50.00	50.00	50.00	7,374	47.00	50.00	49.95
1909.....	6,600	44.00	50.00	45.45	7,425	45.00	47.50	45.06
1910.....	1,300	45.00	45.00	45.00	7,240	45.00	45.00	45.00
1911.....	800	45.00	45.00	45.00	240	45.00	45.00	45.00

Years.	Cleveland.				Summary.			
	Tons.	Price per ton.			Tons.	Price per ton.		
		Lowest.	Highest.	Average.		Lowest.	Highest.	Average.
1900.....	700	\$50.00	\$55.00	\$53.21	3,681	\$37.50	\$55.00	\$44.02
1901.....	1,508	40.74	50.00	45.99	23,258	37.50	52.50	43.15
1902.....	3,329	40.74	55.00	45.82	35,242	37.50	55.00	41.93
1903.....	4,736	45.00	55.00	45.38	26,677	39.60	55.00	43.20
1904.....	820	45.00	46.00	45.12	22,796	39.60	49.00	43.40
1905.....	8,528	41.00	46.00	42.14	84,189	40.00	48.50	41.59
1906.....	10,301	38.00	45.00	41.40	83,886	38.00	47.00	40.27
1907.....	7,563	38.00	50.00	40.75	77,871	38.00	50.00	40.97
1908.....	9,972	41.00	55.00	46.82	97,008	41.00	55.00	43.72
1909.....	9,925	44.00	52.00	44.46	76,160	42.00	52.00	43.09
1910.....	5,471	44.00	47.00	44.52	43,085	42.00	48.00	44.64
1911.....	4,575	45.00	47.00	45.02	111,297	43.20	47.00	44.02

TABLE 21.—Prices of news-print paper in Middle Western cities and in New Orleans—Con.

Years.	New Orleans.			
	Tons.	Price per ton.		
		Lowest.	Highest.	Average.
1901.....	2,050	\$40.00	\$46.00	\$43.15
1902.....	1,133	40.00	48.00	44.47
1903.....	1,567	45.00	48.00	47.61
1904.....	1,750	48.00	48.00	48.00
1905.....	2,625	45.00	48.00	47.00
1906.....	1,750	45.00	45.00	45.00
1907.....	2,000	44.00	44.00	44.00
1908.....	2,000	48.00	48.00	48.00
1909.....	2,000	48.00	48.00	48.00
1910.....	2,000	48.00	48.00	48.00
1911.....	5,650	47.20	48.00	47.43

TABLE 22.—Prices of Canadian news-print paper shipments delivered in the United States in 1910.

Principal points of delivery.	Price per 100 pounds f. o. b. mill.		Costs of delivery per 100 pounds in the United States.									
			Freight charges.		Duties.		Commis-sions.		Cartage.		Total costs.	
	Low-est.	High-est.	Low-est.	High-est.	Low-est.	High-est.	Low-est.	High-est.	Low-est.	High-est.	Low-est.	High-est.
New York.....	\$1.40	\$2.1325	\$0.18	\$0.18	\$0.305	\$0.32	.....	\$0.057	\$0.0325	\$0.04	\$1.90	\$2.65
Chicago.....	1.644	2.1375	.18	.18	.1875	.305	\$0.056	.0656	.025	.025	2.22	2.50
St. Louis.....	1.40	1.765	.215	.215	.32	.32	.....	.....	.....	.....	1.935	2.30
Cincinnati.....	1.665	2.0095	.155	.18	.1875	.32	.09	.10	.035	.035	2.175	2.45
San Francisco.....	1.93	1.945	.75	.75	.32	.305	.....	.....	.....	.....	3.00	3.00
Memphis, Tenn.....	1.758	.....	.....	.....	.1875	.....	.....	.....	.....	.....	.....	.....
Nashville, Tenn.....	1.9603	.....	.305	.....	.1875	.....	.1022	.....	.....	.....	2.555	.....
Knoxville, Tenn.....	1.8505	.....	.355	.....	.1875	.....	.....	.....	.....	.....	2.40	.....
Louisville, Ky.....	1.692	1.9365	.....	.18	.....	.1875	.....	.096	.....	.....	2.30	2.40
Springfield, Mass.....	1.98	2.015	.20	.18	.32	.305	.....	.....	.....	.....	2.50	2.50
Springfield, Ohio.....	1.7425	1.965	.155	.155	.1875	.1875	.065	.096	.....	.....	2.15	2.40
Fort Wayne, Ind.....	1.58	1.595	.19	.19	.32	.305	.....	.....	.....	.....	2.09	2.09
Cleveland, Ohio.....	1.925	.....	.17	.....	.305	.....	.....	.....	.....	.....	2.40	.....
Youngstown, Ohio.....	1.635	.....	.18	.....	.32	.....	.....	.....	.....	.....	2.135	.....
Dayton, Ohio.....	1.8158	.....	.155	.....	.1875	.....	.0667	.....	.....	.....	2.225	.....
Camden, N. J.....	1.585	.....	.22	.....	.32	.....	.....	.....	.035	.....	2.175	.....
Detroit, Mich.....	1.615	1.63	.155	.155	.32	.305	.....	.....	.035	.035	2.125	2.125

TABLE 23.—Prices of news-print paper exported from Canada to the United States during the year 1910.

Destination.	F. o. b. mill.		Delivered in United States.	
	Tons.	Average price per ton.	Tons.	Average price per ton.
Boston.....	44	\$36.98	22	\$45.53
New York.....	638	38.72	616	48.81
Philadelphia.....	23	39.51	23	50.02
Pittsburg.....	99	39.00	.....	.....
Buffalo.....	223	39.06	202	48.92
Summary for the 5 cities.....	1,027	39.06	863	48.92
Chicago.....	730	36.84	730	45.78
St. Louis.....	279	34.91	235	45.26
Cincinnati.....	943	36.57	475	46.43
Cleveland.....	66	39.43	85	47.07
Summary for the 4 middle western cities.....	2,018	36.51	1,525	45.97

Taking the eastern territory we find from Table 19 that in the city of New York the lowest price charged by the mills in Group I was \$37.50 in 1898, which was reduced to \$35 in 1900, and remained unchanged during the life of some of the old long-term contracts until 1905, when it was raised to \$37.60, until by gradual increases it was advanced to \$44.20 in 1910, dropping in 1911 to \$43.20. The year 1900 was marked by the announcement on the part of a number of mills of a new price policy, namely, the discontinuance of long-term contracts and the substitution of the annual contract instead. The change in the contract policy is reflected in the set of highest prices, which, as will be seen from the table, rose from \$37.50 in 1898 and \$42.50 in 1899 to \$57 in 1900, which was reduced to \$50 in 1902. Between 1902 and 1908 the highest price for New York fluctuated between \$52 and \$55, dropping to \$50 in 1909, at which it has remained since.

The average price was obtained by dividing the amount of the total sales by the total tons sold during each year. This price shows a gradual rise, with fluctuations up and down, from \$37.50 in 1898 to \$44.51 in 1911.

The prices in the other large cities in the eastern territory charged by this group of mills appear from the table. In some cases, as Philadelphia, for example, the fluctuation over the period is less, but from the last column but one it appears that the summary for the seven large cities shows a movement very close to that for New York. The last column gives a summary for the smaller eastern cities. This shows a higher level of prices, but a much smaller fluctuation over the 10 years. The lowest prices start with \$43 in 1900, dropping to \$40 the following year, rising to \$44 in 1904, dropping again to \$37 in 1905, and, with a few fluctuations up and down, reaching \$45 during the year 1911. The highest prices fluctuate between \$60 in 1900 and \$55 in 1911. The average price is much closer to the lowest than to the highest, showing that the higher set of prices represents a much smaller tonnage than the lowest. It is also noteworthy that the average price for the smaller cities shows practically no change in the prices during the 10-year period, and, if anything, a lower level at present as compared with the beginning of the decade, the price in 1900 being \$46.38 and \$45.39 in 1911. This is obviously explained by the fact that the low prices shown in the earlier period are due to the long-term contracts made with the metropolitan dailies.

In weighing the relative importance of the two sets of prices it is well to note that the tonnage of all the small towns in the eastern territory is much smaller than that in the seven large cities in the same territory, being 22,005 tons for the former as against 198,133 for the latter in 1911. With the exception of the year 1900, the ratio between the tonnages of the two groups of cities in 1911 is the smallest during the decade, rising to more than one-third in other years during the decade.

Table 20 shows the course of prices in New York City and five large cities of the eastern territory charged by the mills in Group II. The price quotations in Group II show a considerably lower level of prices in the lowest as well as the highest quotations. Thus the lowest price for the same cities in Group II for 1901 was \$34 as compared with \$35 in Group I. The price was raised in 1907 to \$37 as compared with \$38

in Group I, and remained at \$37 until 1910, when it was \$44 in Group I. It rose to \$41.80 in 1911, during which year it for the first time exceeded the corresponding price in Group I, where it was \$40.

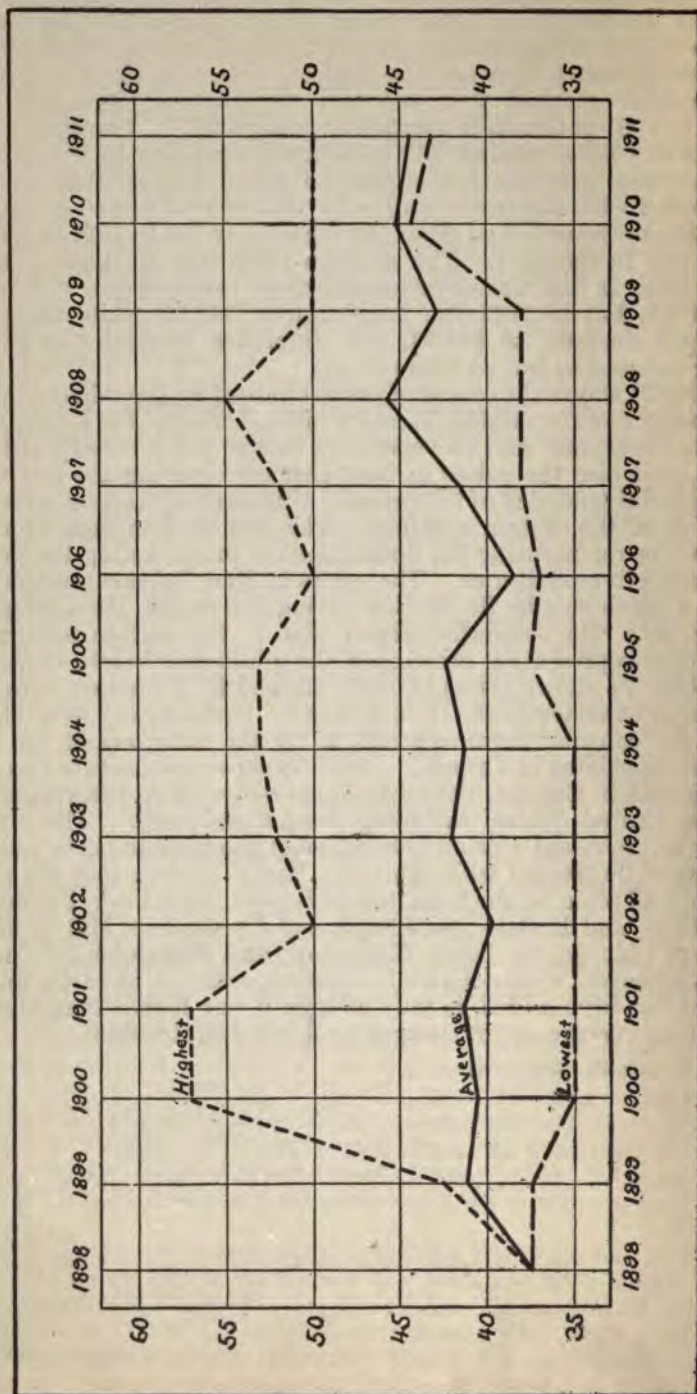
The difference between the highest prices in the two groups is much more marked than between the lowest. Thus the highest price in 1901 in Group II was \$45 as against \$57 in Group I. It rose to \$48 in 1903 as against \$52 in Group I, dropping to \$46 in 1905 as against \$55 in Group I, and had a further drop in 1906 to \$42, as compared with \$55 in Group I. In 1907 it rose to \$50 as compared with \$55 in Group I, and gradually declined to \$45 in 1911 as compared with \$52 in Group I. The average price was likewise at a lower level than in the first-mentioned group, measuring a difference of about \$5, but in 1911 the price rose to \$43.90, while the price in Group I declined to \$44.31, the difference between the two thus being reduced to but 41 cents a ton.

Table 21 shows the course of prices charged by the mills represented by Group I in the Middle Western cities, Chicago, St. Louis, Indianapolis, Cincinnati, and Cleveland, as well as the summary of the five cities, and also the prices in New Orleans covering the last decade. The general tendency of the prices in this territory is substantially the same as in the eastern territory. This can be seen upon comparing the curves representing the fluctuations in prices during the period in the respective territories. The prices in New Orleans, on the whole, show a much smaller fluctuation during the period, the average price being, as a rule, somewhat higher than in the eastern territory, the difference representing principally the additional freight expense.

Tables 22 shows prices in 1910 charged by Canadian paper mills for paper exported to the United States. These prices were obtained from the consular invoices sworn to by the exporters at the United States consulates in Canada. Table 23 shows two sets of prices, one f. o. b. mill in Canada, the other prices delivered in the various cities in the United States, including freight and duty. These figures, however, represent a small percentage of the total imports and therefore must be treated with caution. It will be seen that the average f. o. b. mill price for the five cities of Boston, New York, Philadelphia, Pittsburg, and Buffalo was \$39.06, and for the four Middle Western cities of Chicago, St. Louis, Cincinnati, and Cleveland \$46.51. The price, however, when delivered in the respective cities, after duty and freight has been added, is fully as high if not higher than the corresponding average prices charged by United States mills.

CHART I.

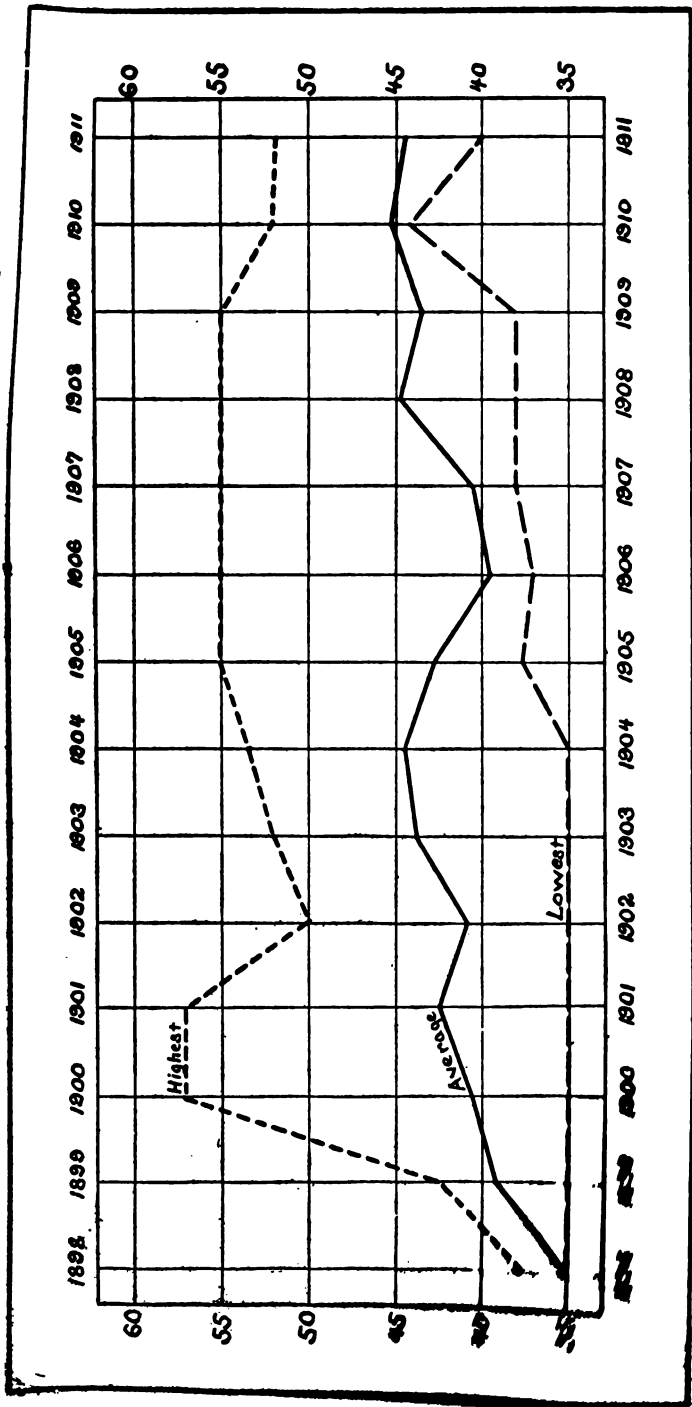
Prices of news-print paper in New York City charged by mills in Group 1.



(See Table 19.)

CHART II.

Prices of news-print paper in seven largest cities in eastern territory charged by mills in Group 1.



(See Table 19.)

CHART III.

Prices of news-print paper in eastern territory outside of seven largest cities charged by mills in Group 1.

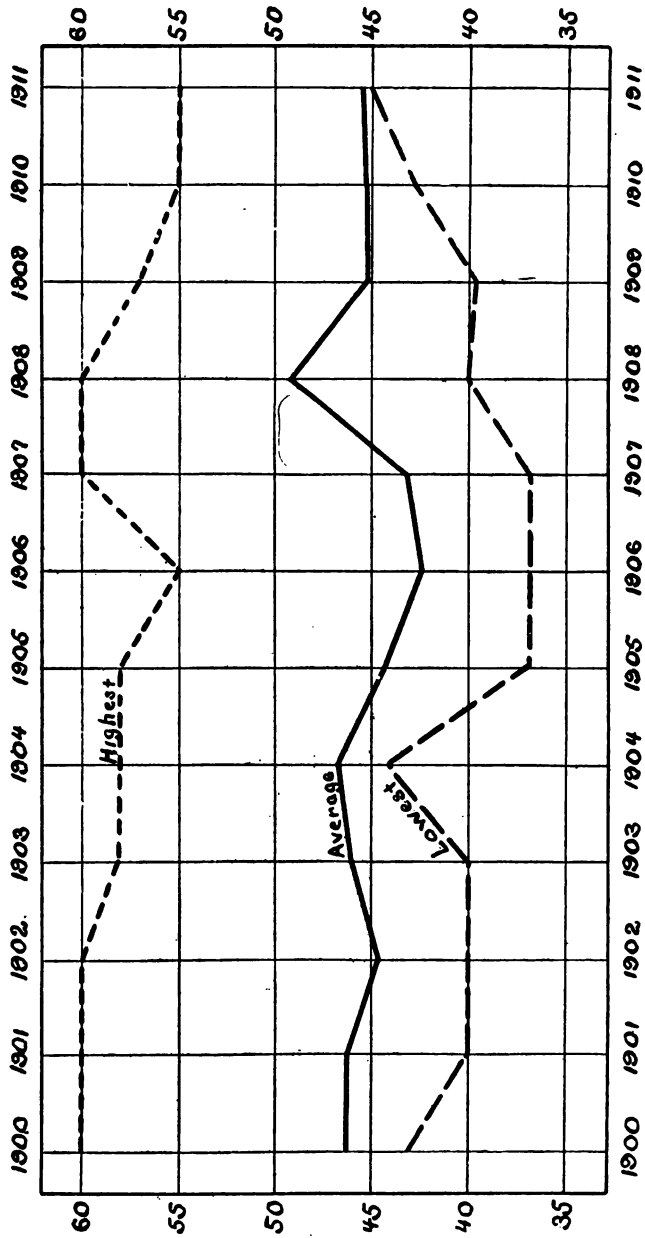
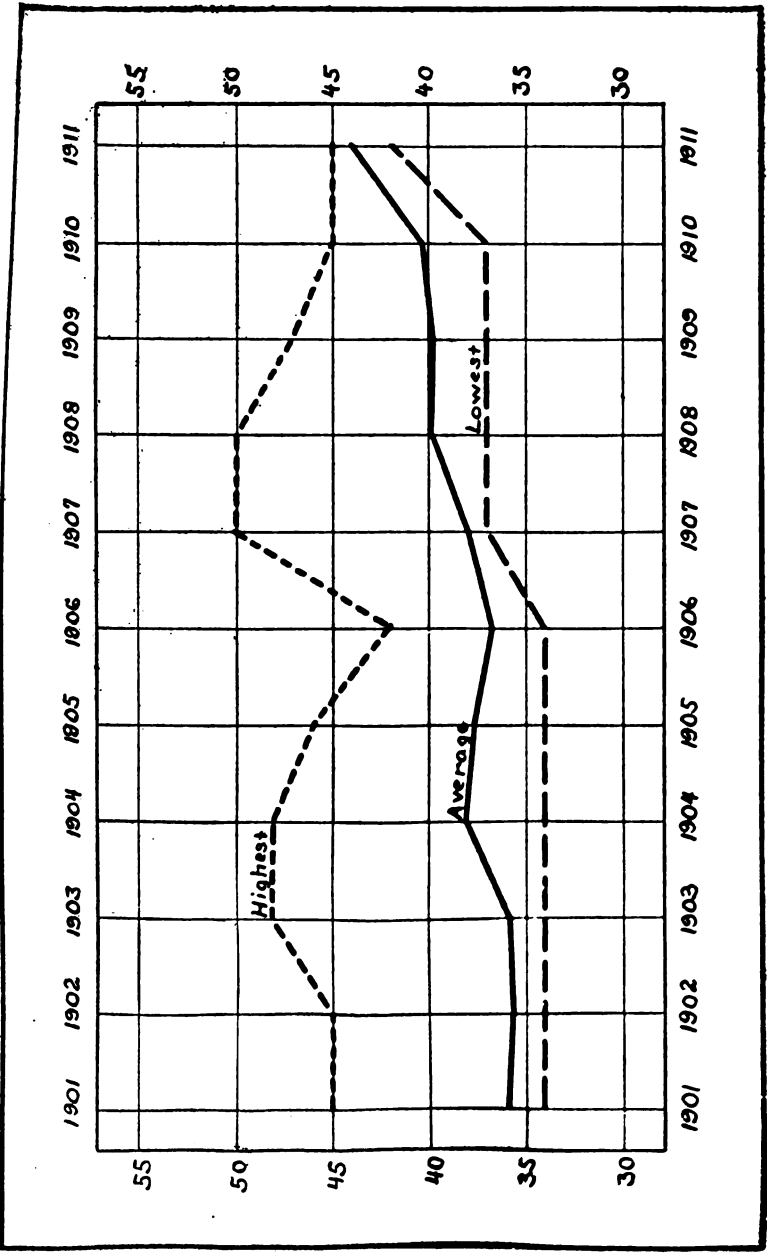


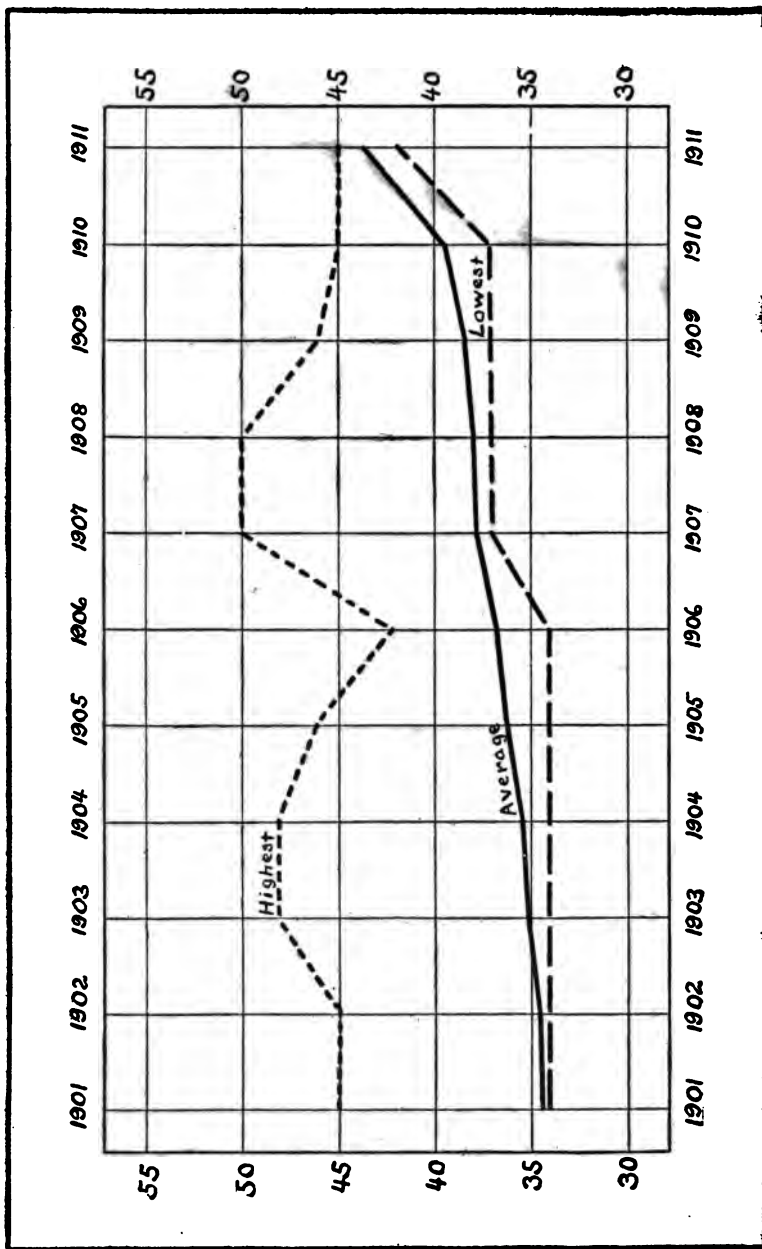
CHART IV.
Prices of news-print paper in New York City charged by mills in Group 2.



(See Table 21.)

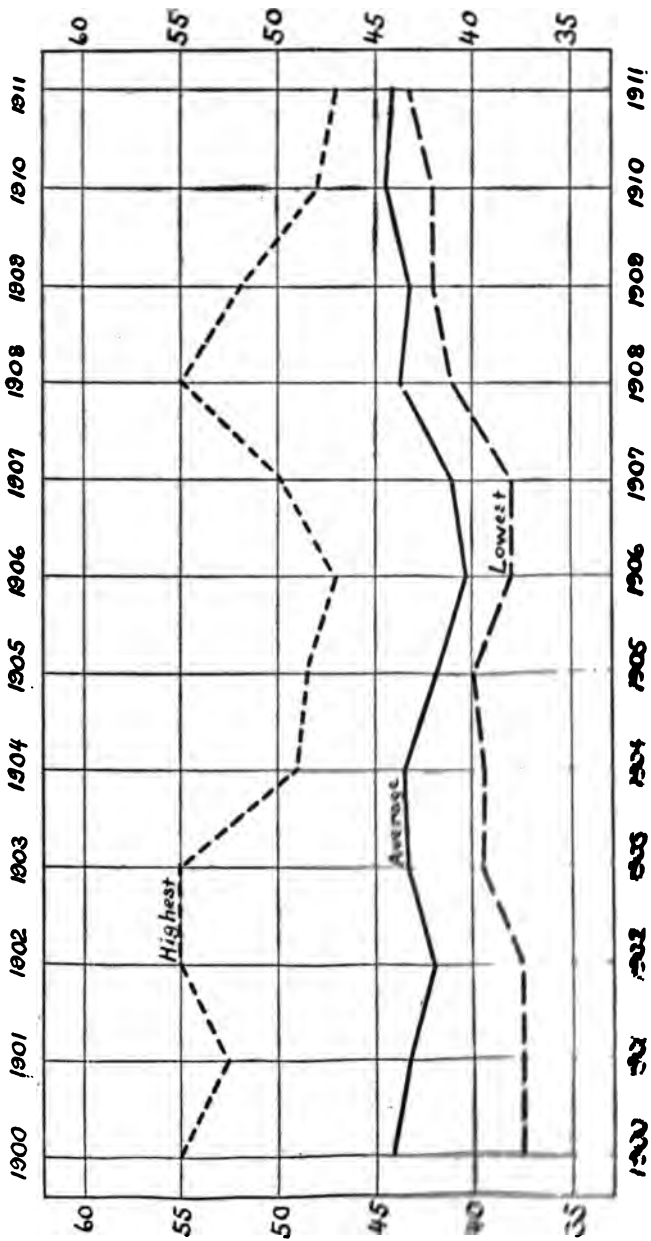
CHART V.

Prices of news-print paper in five large cities in eastern territory charged by mills in Group 2.



(See Table 21.)

CHART VI.
Prices of news-print paper in five large middle western cities.



(See Table 22.)

PART X.

CAPITAL INVESTMENT AND DEPRECIATION.

Any full consideration of the subject of cost of producing news-print paper involves some discussion of the question of the investment involved in relation to output. This is necessary both as a basis for estimating the charge to be allowed for depreciation and as a basis for understanding the real significance of the margin between mill cost and selling price. The ratio of capital investment to output in this industry is high. On this point, as on all others, conflicting claims are made. Some firms assert that the annual turnover is not more than 40 per cent of the investment. No absolute figures are available, but it may be stated as an approximation that the annual product (at average mill cost) is not far from one-half the necessary capital invested.

In estimating investment the most convenient method is to take as a basis the daily ton of output of a balanced plant. By a balanced plant is meant a combination of ground-wood mill and sulphite mill with a paper plant such that the pulp needs of the latter are practically taken care of by the two pulp mills. To the cost of building and equipping the three mills must be added the cost of hydraulic development to produce the necessary horsepower for the grinders and additional power converted into electrical energy for incidental machines in the mills.

It is out of the question to make any general statements as to investment in woodlands for the supply of the raw material, since the policies of different companies vary so greatly and the prices of woodlands have fluctuated so widely under the influence of a speculative demand. So far as the relation of investment to cost is concerned this would not be a factor where the wood is bought from subsidiary companies, or charged into the pulp mills, at a price which includes profits and stumpage. Where, however, the wood is charged in at a price which represents only the absolute cost of cutting and delivering, the margin between mill cost of paper and selling price would be higher, and this higher margin would represent a return on the woodland investment as well as on the investment in plant.

For similar reasons the problem of the value of riparian rights and the cost of water storage is not susceptible of any general treatment. Storage facilities are a necessity for a water-power development, provided that a uniform yearly flow is needed in order to deliver the ground wood pulp with daily regularity. Its value might be estimated by comparison with the cost of the necessary auxiliary steam power required to provide a constant horsepower. A better method, if the cost of storage be disregarded, is to include in the investment the additional grinder capacity necessary to produce during periods of good water an adequate supply of ground wood pulp to carry the mill over the periods of low water. For example, if we assume that

80 tons of ground wood are used for each 100 tons of paper, a plant producing 100 tons of paper to-day would not be properly "balanced" (in the absence of adequate water storage) if its ground-wood capacity was only 80 tons per day. Estimates of the excess allowance naturally depend upon local water conditions. One well-equipped plant making 100 tons per day is able to supply its own pulp with a grinder capacity of 140 tons of ground wood in the face of bad water conditions. Even higher estimates have been made in some cases, but this is probably a fair sample, on the basis of no water storage. The better the storage the smaller the number of grinders necessary.

The cost of hydraulic development is purely a matter of local conditions and may vary from below \$30 to over \$100 per horsepower.

A desirable site for a water-power development is valued, first, by the extent of its drainage area; second, its run-off per square mile; third, the constancy of this run-off, which fixes the average yearly flow; fourth, the reservoir possibilities; fifth, the length and height of the dam and the necessary length of the penstocks and flumes to carry the water to the turbines; and, sixth, by the riparian rights.

Again, a power site in a remote location would not stand as high an investment as would a site in a location where its cost of development would be regulated on the basis of what the power could be disposed of for manufacturing purposes.

Climatic conditions are also a factor in the cost of developing a power, due to their influence on the fluctuation in flow from severe winters in northern climates and dry summers in warmer climates. It is obvious, therefore, that the value of a water power for a ground-wood property must be determined entirely by the local conditions. This variation being so great, any attempt to fix a definite cost per ton of production without exact knowledge of the site is problematical.

The calculation in any case would depend on the amount of horsepower needed per ton of product and the cost of development per horsepower. No certain figure can be given for either.

Taking the matter of horsepower for the grinders per ton of ground wood, this varies in different plants from 60 to 70 or more. If 70 be taken for example, and it is assumed that 80 tons of ground wood is needed for 100 tons of paper, the cost of hydraulic development for the ground-wood mill would be:

- (1) If the cost is \$30 per horsepower:

$$\frac{5,600 \text{ H. P.} \times \$30}{100} = \$1,680 \text{ per daily ton of paper.}$$

- (2) If the cost is \$100 per horsepower:

$$\frac{5,600 \text{ H. P.} \times \$100}{100} = \$5,600 \text{ per daily ton of paper.}$$

Further allowance must be made for additional power for electrical energy. Seventy-five or eighty horsepower per ton of paper per day is a common estimate for a balanced plant.

Such calculations do not provide for excess grinding capacity, to make sure of a uniform supply of pulp in absence of water storage. If this should be included on a basis of 140 tons ground-wood capacity to 100 tons of paper, with 65 horsepower per ton of ground wood, and 10 additional horsepower per ton of paper, we should have 9,100

horsepower for grinders and 1,000 horsepower for other purposes. Then

- (1) At a cost of \$30 per horsepower:

$$\frac{10,100 \text{ H. P.} \times \$30}{100} = \$3,030 \text{ per daily ton of paper.}$$

- (2) At a cost of \$100 per horsepower:

$$\frac{10,100 \text{ H. P.} \times \$100}{100} = \$10,100 \text{ per daily ton of paper.}$$

The construction cost of the balanced plant will be lower than the cost for the three separate units built independently. The equipment, which is the largest item of the total cost, would be the same.

The equipment comprises:

Ground-wood mill.—Three pocket grinders, directly connected to horizontal turbines, centrifugal screens, 72-inch wet machines, hydraulic pulp presses, log hauls, slasher saw rigs, barkers, splitters, conveyors, etc.

The auxiliary power plant for driving machinery other than the grinders is commonly provided by electric current generated by an independent horizontal turbine. The power, derived through burning the waste wood, is utilized for heating and other incidental auxiliaries.

Sulphite mill.—The equipment of the sulphite mill comprises:

In the wood room: Log haul, saw rig, barkers, splitters, chippers, crushers, chip screen, conveyors, and elevators. The refuse from this operation being conveyed to an auxiliary shaving-burning boiler in the power house, and utilized for heating the sulphite mill.

In the digester house: Digesters, and the necessary pumping equipment.

In the blow-pit room: Blow pits and pumps.

In the wet machine and screen room: Complete diaphragm screen equipment with auxiliary feltless wet machines and slushers.

Paper mill.—In the beater room: Pulp openers or broke beaters and the usual beater, jordan, chest equipment, and pumps.

In the machine room: Fourdrinier paper machines, screens, slitters, reels, drum winders, chests, suction pumps, and pumping equipment.

In the finishing building: Reels, slitters, and cutters.

It will appear from the above statements that the calculation of necessary capital investment per ton per day is by no means an easy matter. The lowest actual balanced mill which we have examined in this regard shows \$15,000. The lowest calculations we have received (from a professional engineer) show an estimated range from \$15,000 for a 25-ton mill, with \$13,000 for a 50-ton mill, and \$10,900 for a 100-ton mill to \$9,700 for a 200-ton mill. These last figures do not include any part of the cost of hydraulic development, so that the totals would be increased by this amount, which, on the basis of 75 horsepower per ton, would be \$2,250 if the cost per horsepower is \$30, or \$3,750 at a cost per horsepower of \$50, or \$7,500 at a cost per horsepower of \$100.

It may be said in general terms that under normal conditions an investment for hydraulic power and fully equipped balanced plant, of best construction and equipment, and a capacity of 100 tons per day, ought to be fully covered by \$17,000 per ton per day. For a

plant of smaller capacity the cost would be somewhat greater. This does not include either cost of water storage facilities or provision for extra grinding capacity to offset lack of such storage. If these were included the total might be increased to \$20,000. Either of these figures should be taken as a liberal estimate.

Besides the actual investment for plant and power development the element of working capital is a large item in this industry. We have varying statements on this head from \$2,500 to \$6,000 per ton per day. In the report made to us by a competent engineer it is calculated by him that working capital required per ton per day would be \$3,200 for a 200-ton plant, \$3,500 for a 100-ton plant, and \$3,900 for a 50-ton plant.

If working capital is included as a part of the total investment, no interest charge on this item should be included in cost. If, however, the investment is taken to represent only construction and development and the working capital is borrowed outside, the interest should be included. On the basis of \$3,500 per ton per day this charge would be from 50 to 60 cents per ton.

DEPRECIATION CHARGES.

Under the head of depreciation it becomes important, first, to define just what is meant by the term, and what is covered as well as what is not covered by the estimate of depreciation as here given. First, then, it is assumed that the plant will be kept in perfect repair in so far as that is humanly possible. All charges for maintenance, repairs, renewals of worn-out parts or machines (not involving new equipment or increased production), and all upkeep expense shall be charged to operating expense.

Depreciation is that charge, in the form of a per cent on capital consumed in construction and equipment, which, spread evenly over the estimated life of the plant as a whole, will provide a fund which at the close of the life of the plant will equal the investment. It is not a charge in lieu of a maintenance charge, but in excess of actual maintenance and upkeep, to take care of that inevitable decay which ultimately comes in spite of renewals and repairs. It is a charge which will return the original investment when the plant itself is past repairing. It includes the creation of a fund to take care of the obsolescence of machinery by reason of new inventions or improvements of machinery which renders the equipment antiquated and no longer economical. It is, in short, an insurance fund against the ravages of mechanical improvements and processes and the decay which inevitably comes with time.

As to obsolescence, it is believed and presumed that the Fourdrinier has about reached the limit of perfection, and an up-to-date machine will not be displaced before it would be entirely worn out, barring, of course, some complete revolution in method of production of paper which would render the Fourdrinier itself obsolete. That 3 per cent on actual construction cost (which is what is here meant by capital investment) will take care of depreciation and obsolescence of the whole plant is the estimate of competent engineers. This will provide a fund in 33 years equal to the original cost. With adequate upkeep, of course, a plant will last much longer than this, but the element of obsolescence might absorb the difference.

There are specific parts of the plant, such as water development, where the depreciation would not be more than half that amount; in such parts as foundations, etc., it would be nothing, practically, while on some parts of the equipment it would be entirely inadequate; but taking the plant and the investment as a whole, 3 per cent is ample to cover all actual depreciation in excess of upkeep.

The high cost of plant and equipment in the paper industry makes the depreciation charge per ton figure as a high percentage of the cost of product if entered as a cost item. As already stated, since most of the mills did not charge off depreciation to cost, the depreciation item was taken out of all the schedules to make the figure comparable. In some cases the amounts actually charged to depreciation and taken out of the figures, as presented in the tables, were from \$1 to \$1.92 per ton.

If the investment cost per ton per day be taken at \$15,000, the total investment for a 100-ton plant would be \$1,500,000, and a 3 per cent depreciation charge would amount to \$1.45 per ton. On a basis of \$17,000 per ton per day as an investment, the depreciation charge would be practically \$1.75 per ton of paper. The basis here is full production for 310 days in the year. Paper mills do not, as a rule, run on Sunday. Pulp mills commonly do.

If a 3 per cent allowance for depreciation be excessive, the charge per ton would, of course, be correspondingly reduced. It should be said, furthermore, that unusually high investment of capital per ton per day is due primarily to increased cost of hydraulic development rather than to equipment, and that on this part of the investment the depreciation is practically nil; so that a 3 per cent charge on a total investment, of which a relatively large proportion is for power development, would be excessive.

Since we publish figures of mill cost and also figures of prices it is necessary to consider briefly the relation between the two in connection with investment. It is not the problem of a board of inquiry to consider what is a "reasonable" price or a "reasonable" profit. At the same time certain illustrative examples should prove of value. The greater the necessary investment for a given value of product, the higher must the margin be between mill cost and mill selling price. Profit per unit of product means nothing as to profit on investment unless the amount of the investment is known. Investment figures as already shown vary widely. Any of the following calculations are purely illustrative and can easily be adjusted to different investment estimates.

If we start, for illustration, with a 100-ton balanced mill, and assume (1) investment of \$17,000 per ton per day, (2) a full output of 31,000 tons per year, (3) a depreciation charge of 3 per cent or \$1.75 per ton, (4) interest on working capital (\$3,500 per ton per day), say 60 cents per ton, if not included in total investment, (5) a margin between mill cost and price f. o. b. mill of \$10, we should get as a result:

mill.....	\$10.00
depreciation.....	\$1.75
interest.....	.60
	<hr/>
	2.35
	<hr/>
	7.65

On 31,000 tons this would be \$237,150 per year, or 13.94 per cent, on a total investment of \$1,700,000. Keeping the depreciation charge constant, as deducted from nominal margin—that is, allowing in no case more than a 3 per cent depreciation on \$17,000 per ton per day—we should have on the nominal margin of \$10 between mill cost (less depreciation and interest on working capital) for an investment of \$17,000 per ton per day, 13.94 per cent on investment; \$20,000 per ton per day, 11.85 per cent on investment; \$25,000 per ton per day, 9.40 per cent on investment; \$30,000 per ton per day, 7.90 per cent on investment.

If the margin is \$5, the per cent on investment would be one-half the above. On the other hand, if the amount of investment is less, such a margin would show greater profits. For example, taking the low figure of \$14,000 per ton per day (assuming \$4,000 for hydraulic development and \$10,000 for construction and equipment) the earnings on investment would be 17.82 per cent.

The matter may, perhaps, be made clearer by being put in another way. Suppose a well-balanced plant to own its own wood supplies and to charge no profit or stumpage on the wood delivered to the pulp mills, and no profit on the pulps delivered to the paper mill. In other words, suppose the whole profit on the total investment for woodlands, hydraulic development, and the three mills to be extracted from the margin between mill cost of paper and mill price. In this case, for purposes of comparison, we may assume that the depreciation charge and interest on working capital are charged into the mill cost, not of course on the basis of the whole investment, including lands, but on a reasonable basis for construction and equipment. In such case a margin of \$10 per ton (after allowing for depreciation and interest on working capital) would represent on a total investment (woodlands included) of—

	Per cent.
\$25,000 per ton per day.....	12.40
\$30,000 per ton per day.....	10.33
\$31,000 per ton per day.....	10.00
\$35,000 per ton per day.....	9.20

From this it appears that after deducting from mill cost all intermediate profits from wood to pulp, but including depreciation on plant, etc., every dollar of margin between cost and price (assuming full output) would represent 1 per cent on an investment of \$31,000.

In connection with figures of this kind reference must be made to the problem of giving a theoretical cost of production based on an ideal plant. In other words, the question may be asked what paper ought to be made for. It has been suggested that in lieu of giving costs as they are we should name some one figure as a "fair cost" in a "typical" or "fair" mill. Any study of cost figures will show that such an estimate would be absolutely unwarranted. We have considered it our function to collect facts and present them in intelligible form. From a consideration of the foregoing tables may be derived the actual existing costs of production, with an analysis of items of transfer profits, depreciation charges, and the like. If for any reason the average under existing conditions is not considered a satisfactory basis of comparison, it is perfectly easy to find from the tables not only the highest and the lowest, but percentages produced at different

costs. The figures of actual cost which we were : vary widely, not only between different mills, b for different periods. At the same time the reac nate the small percentages produced at the two large part of the industry arrive at cost figures separate items, within much narrower margins. wood costs and prices, transfer profits, investmen equipment will furnish additional material for es able" cost to those who care to make them. : however, purely theoretical. They are natural writers or engineers and the most honest estimate are often proved false by the results. In view of held it our obvious duty to avoid theoretical calc the actual costs as we find them under existing c

Cost per unit

100

100 100 100 100



PART XI.

COSTS OF PRODUCTION EXTENDING OVER A SERIES OF YEARS

It may be of interest to compare the cost of production over a longer period than is covered by the general tables in this report. For this purpose not all of the establishments' schedules were available, nor did representatives of the board secure these data for all of the establishments in which they might have been available, owing to the lack of time. However, it is possible to show for several plants, and for some groups, the costs for a considerable period. The number of years covered by the various plants will not be the same, and for this reason some will have to be shown separately. Wherever a number of plants have been used or combined in one table the same plants have been used for each year, that is the statements for each item for each year are for identical plants, and where this could not be safely done no grouping was attempted but the plant shown on separate table. For instance, in the first table which follows a number of sulphite-pulp mills from which itemized cost per ton had been secured are combined into one table. These costs extend over 9 years, i. e., from 1901 to 1909, both inclusive.

TABLE 24.—*Itemized cost of production per ton of sulphite pulp, by years, 1901-1909.*

Items.	1901	1902	1903	1904	1905	1906	1907	1908	1909
Material:									
Sulphur.....	\$3.24	\$3.24	\$3.32	\$3.15	\$2.97	\$2.87	\$2.81	\$2.74	\$3.01
Limestone.....								.07	.11
Lime.....	.73	.65	.69	.64	.63	.57	.55	.49	.46
Wood.....	12.74	13.50	14.02	15.51	16.18	17.03	17.75	21.42	22.27
Total.....	16.71	17.40	18.02	19.30	19.79	20.47	21.12	24.72	25.90
Conversion:									
Manufacturing labor.....	3.90	3.96	4.26	4.38	4.20	4.19	4.59	4.28	3.60
Felts.....	.16	.15	.16	.14	.16	.17	.18	.13	.09
Wires.....				.04	.04	.04	.05	.04	.04
Screen plates.....	.16	.11	.08	.08	.08	.12	.13	.06	.09
Belting.....	.18	.15	.15	.14	.12	.10	.13	.13	.13
Lubricants.....	.06	.05	.05	.06	.05	.05	.06	.05	.04
Repair materials.....	1.45	1.27	1.11	1.35	1.34	1.46	1.57	1.03	1.34
Repair labor.....	.68	.56	.55	.61	.59	.59	.66	.77	.82
Fuel, coal.....	2.18	2.23	2.42	2.22	2.16	2.24	2.31	2.47	2.29
Barn.....			.02	.03	.02	.02	.02	.03	.02
Miscellaneous operating expenses.....	.13	.09	.15	.20	.17	.15	.15	.18	.17
Office.....			.02	.01	.02	.02	.02	.02	.02
Water power.....	.10	.08	.09	.12	.12	.10	.09	.15	.12
Total.....	9.00	8.67	9.05	9.37	9.09	9.26	9.97	9.83	8.77
Direct cost.....	25.71	26.07	27.07	28.67	28.87	29.72	31.06	34.06	34.66
Fixed charges, insurance and taxes...	.01	.01	.01	.02	.27	.25	.24	.46	.34
Total manufacturing cost.....	25.72	26.08	27.08	28.69	29.14	29.97	31.32	34.52	35.02

It will be noted that the increase in total costs from \$25.72 per ton in 1901 to \$35.02 in 1909 is almost exactly equivalent to the increase in cost of wood per ton of pulp—i. e., \$12.74 in 1901 to \$22.27 in 1909. No item in the conversion costs, whether of supplies or of labor, have varied materially. The manufacturing labor cost in 1909 was lower for the average of the mills here considered than in any other year, and the total conversion cost is but 10 cents per ton higher in 1909 (\$8.77) than it was for the lowest year in the period (1902, \$8.67).

The next table shows itemized cost for a much larger number of ground-wood pulp mills for a series of years. The items for 1900 could not be satisfactorily secured, and hence are omitted for that year. Itemized costs per ton of ground-wood pulp are given from 1901 to 1909, inclusive. Here, again, the variations relate almost entirely to the cost of wood, and the increase in wood cost almost exactly equals the advance in total cost. As a matter of fact labor conditions had radically changed in most of these pulp mills; wages had been increased, reduced, and increased again; hours of labor had been radically reduced, and yet manufacturing labor costs were lower at the end of the period (1909) than in the beginning (1901).

TABLE 25.—*Itemized cost of production of ground wood pulp, by years, 1901-1909.*

Items.	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Material, wood.....	\$6.48	\$6.96	\$7.09	\$7.41	\$8.38	\$8.78	\$9.08	\$9.50	\$11.14	\$11.82
Conversion:										
Manufacturing labor.....		2.45	2.37	2.57	2.53	2.46	2.46	2.55	2.64	2.34
Pulp stones.....		.14	.12	.11	.10	.09	.10	.11	.11	.10
Felts.....		.16	.12	.11	.11	.12	.14	.13	.10	.09
Wires.....				.01	.03	.03	.03	.04	.04	.04
Screen plates.....		.08	.05	.06	.06	.07	.07	.05	.05	.06
Belting.....		.10	.07	.07	.07	.06	.06	.07	.07	.06
Lubricants.....		.05	.04	.03	.04	.04	.04	.04	.04	.04
Repair materials.....		.56	.49	.49	.61	.56	.62	.77	.88	.59
Repair labor.....		.37	.29	.32	.36	.30	.29	.32	.41	.43
Fuel, coal.....		.02	.01		.04	.02	.01	.02	.04	.03
Barn.....				.03	.04	.03	.03	.02	.03	.02
Miscellaneous operating expenses.....		.11	.10	.04	.05	.06	.07	.07	.16	.24
Office.....				.01	.01	.02	.02	.02	.02	.02
Water power.....		.38	.34	.37	.36	.36	.37	.40	.60	.45
Total.....	4.15	4.42	4.01	4.25	4.47	4.21	4.31	4.60	5.19	4.51
Direct cost.....	10.63	11.38	11.10	11.66	12.85	12.98	13.39	14.10	16.34	16.33
Fixed charges:										
Insurance and taxes.....		.04	.03	.05	.07	.17	.17	.15	.32	.25
General expense.....		.09	.08	.10	.11	.08	.08	.09		
Total.....	.21	.13	.12	.15	.19	.25	.25	.25	.32	.25
Total manufacturing cost.....	10.84	11.51	11.22	11.81	13.04	13.23	13.64	14.35	16.66	16.58

Below will be found a table itemizing the cost of production for news-print paper per ton, by years, from 1900 to 1909, inclusive. The picture here is a composite one; that is, the figures are the average for a number of mills, the same plants being used each year. The cost of material will be seen here, too, as the varying element, labor costs changing little. To the cost of manufacture here has been added the cost of marketing and the margin, which must not be confused with profit, as margin here means simply the amount per ton left with which to pay interest, depreciation, and profits.

TABLE 26.—*Cost of production per ton of news-print paper, itemized, and by years from 1900 to 1909, inclusive.*

Items.	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Material:										
Ground wood.....	\$9.54	\$10.00	\$9.41	\$10.24	\$11.56	\$11.08	\$11.49	\$12.22	\$13.33	\$12.92
Sulphite.....	8.50	9.02	8.32	8.44	9.34	8.53	8.25	9.05	10.26	10.15
Wrappers.....	.52	.76	.70	.66	.70	.63	.60	.56	.63	.61
Fillers.....	.66	.67	.57	.46	.46	.49	.49	.37	.34	.35
Alum.....	.24	.27	.27	.27	.25	.23	.21	.19	.21	.19
Bleach chemicals.....	.12	.10	.05	.03	.03	.02	.02	.01	.01	.01
Color.....	.10	.10	.11	.12	.13	.15	.16	.16	.14	.14
Sizing.....	.16	.15	.15	.15	.16	.20	.17	.16	.14	.18
Total.....	19.84	21.07	19.58	20.37	22.63	21.34	21.38	22.71	25.05	24.55
Conversion:										
Manufacturing labor.....	3.80	4.00	4.11	4.15	3.94	3.83	3.80	4.19	4.35	3.73
Felts.....	.57	.63	.61	.56	.64	.72	.76	.83	.91	.81
Wires.....	.44	.45	.38	.31	.32	.32	.33	.32	.34	.33
Screen plates.....	.04	.04	.03	.02	.03	.02	.02	.03	.02	.02
Beltting.....	.14	.15	.13	.12	.12	.11	.10	.11	.13	.12
Lubricants.....	.07	.07	.06	.06	.06	.06	.07	.08	.08	.08
Finishing material.....	.52	.44	.41	.42	.45	.44	.45	.35	.37	.36
Repair material.....	.88	.85	.91	.75	.89	.94	1.01	1.09	.99	1.02
Repair labor.....	.45	.62	.58	.59	.59	.55	.49	.63	.70	.65
Fuel coal.....	2.19	2.30	2.34	2.60	2.34	2.22	2.17	2.23	2.29	2.03
Barn.....									.03	.02
Miscellaneous operating expenses.....	.18	.15	.13	.09	.09	.10	.08	.09	.14	.08
Office.....				.03	.03	.03	.03	.02	.03	.03
Water rents.....	.17	.18	.16	.15	.13	.13	.12	.11	.16	.11
Total.....	9.44	9.88	9.84	9.85	9.65	9.46	9.42	9.96	10.54	9.40
Direct cost.....	29.28	30.95	29.42	30.22	32.28	30.80	30.80	32.67	35.59	33.95
Insurance and taxes.....	.42	.46	.44	.46	.43	.30	.28	.31	.51	.34
Administration.....	.96	1.02	1.26	1.42	1.48	.94	.86	.85	1.25	.91
Manufacturing total.....	30.66	32.43	31.12	32.10	34.19	32.04	31.94	33.83	37.35	35.20
Marketing:										
Freight, cartage, and storage.....	3.40	3.36	3.54	3.68	3.87	3.70	3.89	3.67	3.91	3.89
Sales division expenses.....	.40	.40	.38	.24	.24	.23	.21	.19	.28	.20
Settlement charges.....	2.40	2.54	1.94	1.54	.91	.95	.70	.51	.45	.29
Total.....	6.20	6.30	5.86	5.46	5.02	4.89	4.81	4.37	4.64	4.37
Total cost delivered.....	36.86	38.73	36.98	37.56	39.21	36.93	36.75	38.20	41.99	39.57

Following these are figures for single plants, spread over a series of years. In one plant the cost sheets have been transformed into a table of relatives which may be illuminating. In this case the costs for 1902 are taken as 100 per cent, the other years showing a rise or fall in itemized costs in their relation to the cost in 1902. That is to say, take the top line, the ground-wood pulp charged in this paper mill as \$100 in 1902, would cost \$121.19 in 1903, \$101.55 in 1904, etc. The plant buys all of its sulphite pulp. The items of labor and salaries are here unfortunately combined, but it was ascertained that salaries had remained practically stationary, and that wage rates had been increased twice between 1902 and 1909. The descending scale of relative labor costs is explained by the increased production shown on the bottom line. The equipment of the plant remained practically identical.

TABLE 27.—*Relative cost of production of news-print paper for a series of years, taking 1902 as representing 100 per cent.*

Items.	1902	1903	1904	1905	1906	1907	1908	1909
Ground wood.....	100.00	121.19	101.55	107.50	138.85	171.08	169.53	151.86
Sulphite.....	100.00	81.55	88.19	99.27	107.52	104.85	92.71	96.84
Fuel.....	100.00	85.72	77.55	67.34	87.75	111.22	96.94	74.50
Felts.....	100.00	91.90	83.78	75.41	75.38	89.19	75.67	78.39
Wires.....	100.00	104.00	76.00	68.00	60.00	72.00	48.00	64.00
Alum.....	100.00	90.00	70.00	70.00	70.00	75.00	75.00	66.00
Clay.....	100.00	100.00	76.47	76.47	70.59	76.47	100.00	135.29
Size.....	100.00	130.00	150.00	220.00	210.00	160.00	240.00	270.00
Oil and light.....	100.00	100.00	100.00	100.00	100.00	100.00	71.43	57.14
Belt.....	100.00	116.67	150.00	100.00	66.67	83.33	83.33	50.00
Color.....	100.00	100.00	140.00	180.00	180.00	200.00	180.00	160.00
Labor and salary.....	100.00	106.95	92.38	84.76	81.78	86.42	90.06	83.77
Power rental.....				100.00	100.00	100.00	100.00	100.00
Repairs.....	100.00	118.88	105.04	105.66	150.94	222.64	136.00	145.30
Team.....	100.00	127.55	127.55	114.28	88.71	127.55	142.85	100.00
Finishing.....	100.00	112.77	119.15	108.51	87.23	97.87	110.64	91.49
Expense.....	100.00	62.35	129.41	182.35	117.65	188.23	200.00	205.88
Insurance.....	100.00	131.25	137.50	106.25	62.50	87.50	68.75	69.35
Taxes.....	100.00	100.00	125.00	162.50	175.00	225.00	187.50	287.50
Total cost.....	100.00	103.00	97.49	98.96	110.39	126.36	112.99	112.98
Price received for paper.....	100.00	105.18	106.18	93.26	92.75	103.63	107.25	103.10
Product (increased).....	100.00	102.36	107.93	112.73	120.29	121.10	127.10	130.81

The following table is for a plant situated in one of the Lake States of the Middle West, and gives in addition to the relative, the actual price paid per rough cord for spruce pulp wood from 1902 to 1909. Here again, for the purpose of more easy comparison with the preceding table, we have introduced a line of relatives, based on 1902 as 100.

TABLE 28.—*Price, actual and relative, for pulp wood, for a series of years.*

1902	1903	1904	1905	1906	1907	1908	1909
3.15	3.40	3.60	4.10	5.15	7.40	7.42	6.60
100.00	107.93	114.28	130.16	163.49	234.92	235.55	209.52

Continuing the discussion of costs over a series of years, the following table presents the cost per 100 pounds of paper, in cents and fractions of cents, over a period of seven years, or from 1903 to 1909, inclusive.

TABLE 29.—*Comparative cost of manufacturing paper.*

[Cost per 100 pounds.]

Items.	1903	1904	1905	1906	1907	1908	1909
Ground wood.....	\$0.549	\$0.460	\$0.487	\$0.629	\$0.775	\$0.768	\$0.687
Sulphite.....	.336	.363	.409	.443	.432	.382	.392
Fuel.....	.084	.076	.066	.086	.109	.095	.073
Felts.....	.034	.031	.028	.029	.033	.028	.029
Wires.....	.026	.019	.017	.015	.018	.012	.016
Alum.....	.018	.014	.014	.014	.015	.015	.013
Clay.....	.017	.013	.013	.012	.013	.017	.023
Size.....	.013	.015	.022	.021	.016	.024	.027
Oil and light.....	.007	.008	.007	.007	.007	.005	.004
Belt.....	.007	.009	.006	.004	.005	.005	.003
Color.....	.005	.007	.009	.009	.010	.009	.008
Labor and salary.....	.323	.279	.256	.247	.261	.272	.253
Power rental.....			.014	.013	.014	.014	.012
Repairs.....	.063	.088	.066	.080	.118	.072	.077
Team.....	.009	.009	.008	.006	.009	.010	.007
Finishing.....	.053	.056	.061	.041	.046	.052	.043
Expenses.....	.014	.022	.031	.020	.032	.034	.035
Insurance.....	.021	.022	.017	.010	.014	.011	.012
Taxes.....	.008	.010	.013	.014	.018	.015	.028
	1.587	1.501	1.524	1.700	1.945	1.840	1.737

Costs for one of the eastern plants showing comparatively low cost figures are shown for a series of years in the table below. This shows that in this plant the low costs were not simply for one year, but that a general range of very economic production has been maintained for a number of years.

TABLE 30.—*Cost of specified items in the manufacture of news-print paper per ton of paper produced, for years 1906, 1907, 1908, 1909, and 1910.*

Items.	1906	1907	1908	1909	1910
Material:					
Ground wood.....	\$9.274	\$12.202	\$10.958	\$11.545	\$14.105
Sulphite.....	7.004	8.530	10.223	9.413	9.775
Waste paper.....	.038	.037	.013	.014	.039
Fillers.....	.470	.458	.443	.343	.278
Alum.....	.175	.069	.143	.153	.191
Color.....	.113	.102	.097	.106	.114
Sizing.....	.161	.096	.106	.118	.202
Total.....	17.236	21.495	21.983	21.693	24.764
Manufacturing labor.....	2.685	2.668	2.877	2.910	2.529
Works expense:					
Felts—					
Wool.....	.343	.412	.282	.265	.235
Canvas.....	.112	.192	.157	.122	.241
Wires.....	.412	.402	.379	.212	.233
Screen plates.....	.019	.016	.007	.044	.049
Belting.....	.032	.061	.054	.058	.043
Lubricants.....	.104	.072	.089	.084	.103
Finishing materials.....	.905	.868	.792	.808	.708
Fuel—					
Coal.....	.954	1.509	1.402	1.007	1.184
Wood.....	.037	.013	.019	.053	.010
Repairs—					
Material.....	.247	.540	.480	.207	.419
Labor.....	.297	.362	.432	.367	.300
Administration expense.....	1.098	1.084	(¹)	1.039	.655
Miscellaneous operating expense.....	.101	.079	.165	.199	.187
Accident insurance.....	.382	.331	.237	.004	.037
Total.....	5.046	5.943	4.404	4.709	4.402
Fixed charges:					
Fire insurance.....	.220	.030	.039	.104	.020
Taxes.....	.206	.415	.088	.440	.322
Total cost in bulk at works.....	25.393	30.551	29.001	29.865	32.127
Depreciation.....	.600	.600	1.009	1.742	1.917
Total cost, including depreciation.....	25.993	31.151	31.000	31.607	34.044

¹ Not reported.

The following table represents the itemized costs per ton of paper, in a so-called "balanced plant," i. e., one making its own pulp, both sulphite and ground-wood. The wood costs at this plant are high; pulps made at the mill are charged into paper, not at a profit but at actual cost of production. Owing to low water, the plant bought some ground-wood pulp in 1908 and 1909 (perhaps to a lesser degree in other years). These purchases, of course, represent some profits. The figures are unrevised and are given as kept by the manufacturer. Attention is here called to the fact that while between 1900 and 1909 the wages of labor were raised twice, and the shift (or hours of labor) changed from 12 and 13 hours to 8 hours per day, the labor cost per ton of product was lower in the two years of high wages and short hours than in the former years of long hours and lower wages.

TABLE 31.—*Cost of specified items in the manufacture of news-print paper, per ton of paper produced, in a "balanced plant" for given years.*

Items.	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Material:										
Ground wood.....	\$8.91	\$10.15	\$9.35	\$10.89	\$11.04	\$9.49	\$9.61	\$10.83	\$13.15	\$14.27
Sulphite.....	7.26	7.50	6.64	6.31	7.59	7.28	7.05	6.66	7.46	7.36
Wrappers.....	.52	.65	.58	.52	.46	.50	.46	.59	.74	.63
Fillers.....	1.09	1.20	.87	.49	.60	.62	.44	.38	.36	.39
Alum.....	.20	.27	.26	.25	.26	.22	.18	.15	.14	.10
Bleach chemicals.....	.01									
Color.....	.07	.06	.08	.09	.09	.11	.12	.10	.11	.10
Sizing.....	.08	.08	.07	.08	.11	.06	.04			
Total.....	18.14	19.91	17.85	18.62	20.15	18.28	17.91	18.72	21.95	22.85
Conversion:										
Manufacturing labor.....	3.53	3.79	4.08	4.40	3.81	3.58	3.54	3.43	3.33	2.86
Felts.....	.69	.74	.70	.75	.71	.76	.79	.91	.98	.95
Wires.....	.60	.58	.47	.39	.37	.37	.37	.38	.40	.44
Screen plates.....	.01	.02	.03	.02	.01	.01	.01	.03	.01	.02
Beltng.....	.22	.24	.18	.17	.13	.13	.11	.09	.15	.11
Lubricants.....	.06	.07	.08	.07	.07	.07	.11	.11	.10	.08
Finishing material.....	.41	.54	.55	.61	.47	.82	.64	.37	.44	.29
Repair material.....	1.45	1.01	1.05	.87	.73	.80	.84	.75	1.25	1.02
Repair labor.....	.41	.68	.49	.53	.58	.63	.56	.52	.94	.60
Fuel, coal.....	2.02	2.31	2.89	2.62	2.42	2.18	1.89	1.83	1.72	1.48
Barn.....				.05	.03	.04	.05	.02	.03	.02
Miscellaneous operating expenses.....	.14	.14	.09	.07	.05	.10	.09	.07	.13	.05
Office.....				.01	.02	.02	.02	.01	.01	.01
Total.....	9.54	10.12	10.61	10.58	9.40	9.51	9.04	8.52	9.49	7.94
Direct cost.....	27.68	30.03	28.46	29.20	29.55	27.79	26.95	27.24	31.44	30.79
Insurance and taxes.....	.56	.54	.54	.54	.47	.30	.24	.24	.30	.23
Administration.....	.96	1.02	1.26	1.42	1.48	.94	.86	.85	1.25	.91
Manufacturing total.....	29.30	31.59	30.26	31.16	31.50	29.03	28.05	28.33	32.99	31.93
Freight, cartage, and storage.....	3.60	3.88	4.34	4.44	4.22	4.42	4.43	3.85	4.26	4.08
Sales-division expenses.....	.40	.40	.38	.24	.23	.23	.21	.19	.28	.30
Settlement charges.....	2.60	2.86	2.44	1.44	1.26	.78	1.18	.71	.43	.25
Marketing total.....	6.60	7.14	7.16	6.12	5.71	5.43	5.83	4.75	4.98	4.53
Total cost delivered.....	35.82	38.73	37.42	37.28	37.23	34.46	33.88	33.08	37.97	36.47

Pulp-wood prices control ground-wood pulp costs of course, but this is not the only element of control. For instance, in the following table the costs per ton of ground-wood pulp are shown in connection with inches of rainfall for five years, showing the influence of rainfall on labor cost per ton. Of course the reason for this is decreased output owing to lack of water power, without a corresponding decrease in pay roll totals.

TABLE 32.—*Comparative cost of manufacturing pulp over a series of years.*

(Cost per ton.)

Items.	1903	1904	1905	1906	1907	1908	1909
Wood.....	\$6.89	\$5.82	\$5.55	\$8.80	\$11.37	\$9.44	\$9.45
Labor.....	4.09	3.14	3.02	3.53	4.59	3.74	3.63
Pulp stones.....	1.06	.03		.09	.05	.08	.04
Felts.....	.12	.09	.11	.12	.13	.12	.15
Beltng.....	.17	.12	.10	.13	.09	.11	.11
Oil.....	.10	.08	.08	.09	.11	.07	.05
Power rental.....			1.68	1.78	1.68	1.70	1.75
Repairs.....	.55	.47	.62	.74	.76	1.62	.81
Water power.....	.16	.12	.01				
Total.....	12.20	9.87	11.07	15.26	18.78	16.88	15.90
Rainfall.....inches..			30.13	23.94	19.47	22.25	21.90

Fortunately costs on sulphite and ground-wood pulps, and for news-print paper in a Canadian mill can be shown in like manner, though for a shorter period, i. e., three years. These tables follow:

TABLE 33.—*Cost of production of news-print paper in a Canadian mill for 1908, 1909, and 1910, per ton of paper produced.*

Items.	1908	1909	1910
Material:			
Ground wood.....	\$9.23	\$8.94	\$9.89
Sulphite.....	7.08	7.14	6.08
Waste.....	.35	.24	.....
Clay.....	.63	.71	.60
Alum.....	.21	.31	.36
Size.....	.11	.24	.30
Color.....	.11	.12	.09
Total material.....	17.58	17.70	17.51
Rubber rolls.....	.....	.....	.31
Manufacturing wages.....	4.01	4.01	3.59
Fuel.....	2.23	1.85	1.59
Repair labor.....	1.00	.90	.79
Repair material.....	1.24	.97	.60
Fels.....	.08	.04	.56
Wires.....	.49	.30	.23
Belting.....	.15	.12	.09
Lubricants.....	.09	.08	.07
Finishing expense.....	1.70	2.07	1.65
Screen plates.....	.10	.04	.02
Miscellaneous.....	.10	.07	.05
General mill material.....	.33	.11	.09
Total conversion.....	12.12	11.16	9.69
Total material and conversion.....	29.70	28.86	27.20
Taxes and insurance.....	.14	.14	.15
General expense.....	.93	.75	.62
Depreciation allowance.....	.06	.09	.05
Total charges and expense.....	1.13	.98	.82
Total cost at mill.....	30.82	29.84	28.02

TABLE 34.—*Cost of production of ground-wood pulp in a Canadian mill for 1908, 1909, and 1910, per ton of pulp produced.*

Items.	1908	1909	1910
Ground wood used.....	\$7.20	\$6.48	\$5.92
Food preparing.....	.67	.47	.38
Logs to mill.....	.46	.43	.22
Log sorting.....	.14	.16	.15
Slits.....	.02	.03	.06
Manufacturing wages.....	1.68	1.44	1.39
Repair labor.....	.37	.44	.50
Repair material.....	.39	.44	.34
Screen plates.....	.12	.06	.04
Belting.....	.05	.04	.04
Lubricants.....	.03	.02	.02
Roller faces.....	.01	.02	.02
Grindstones.....	.14	.19	.13
Miscellaneous.....	.04	.05	.04
General mill material.....	.14	.06	.05
Total conversion.....	4.06	3.87	3.38
Total stock and conversion.....	11.25	10.35	9.25
Taxes and insurance.....	.09	.08	.09
General expense.....	.24	.29	.25
Shipping charges.....	.....	.....	.008
Total charges and expense.....	.43	.37	.35
Total cost at mill.....	11.68	10.72	9.60

TABLE 35.—*Cost of production of sulphite pulp in a Canadian paper mill for 1908, 1909, and 1910 per ton of pulp produced.*

Items.	1908	1909	1910
Material:			
Rough wood used.....	\$14.57	\$13.13	\$11.99
Sulphur.....	2.73	2.82	2.72
Other material.....	.34	.30	.31
Total material.....	17.64	16.25	15.02
Wood preparing.....	1.71	1.47	1.18
Logs to mill.....	.94	.87	.46
Log sorting.....	.27	.32	.32
Manufacturing wages.....	8.12	8.09	2.92
Fuel.....	2.19	1.83	1.56
Felts.....	.15	.15	.12
Repair labor.....	.71	.47	.48
Repair material.....	.76	.53	.53
Belting.....	.06	.04	.06
Lubricants.....	.03	.04	.02
Screen plates.....	.29	.21	.19
Cylinder faces.....	.06	.04	.04
Miscellaneous.....	.07	.04	.06
General mill material.....	.34	.13	.13
Total conversion.....	10.70	9.23	8.04
Total stock and conversion.....	28.34	25.48	23.06
Taxes and insurance.....	.21	.22	.26
General expense.....	.89	.73	.65
Sulphite mill allowance.....	.05	.04	.06
Total charges and expense.....	1.15	.99	.96
Total cost at mill.....	29.49	26.47	24.02

PART XII.

AMOUNT, VALUE, AND SOURCES OF WOOD PULP IMPORTS INTO THE UNITED STATES.

Like the tariff acts of 1890, 1894, 1897, and 1909, our import statistics distinguish three kinds of wood pulp: Mechanically ground pulp, unbleached chemical pulp, and bleached chemical pulp. Considering indiscriminately our imports of all three varieties, the relative importance of the several countries of origin is indicated by the following table:

TABLE 36.—Imports of wood pulp of all sorts, according to principal countries of origin, for the fiscal years 1909 and 1910, arranged in the order of total value of imports.

From—	1909		1910	
	Pounds.	Value.	Pounds.	Value.
Canada.....	328,807,225	\$3,406,663	412,356,936	\$4,224,500
Germany.....	98,471,958	1,817,080	158,413,690	2,769,288
Norway.....	76,338,971	1,563,905	125,167,148	2,374,884
Sweden.....	183,918,903	11,317,572	105,550,311	1,640,625
Other countries.....	26,707,915	522,043	45,952,674	758,717
Total.....	614,244,972	8,627,263	847,440,759	11,768,014

¹Excluding mechanically ground wood pulp not given for Sweden in 1909 as of no consequence.

Not only the figures for the years 1909 and 1910 but those for the years preceding 1909 (given in Table 37) indicate that Germany has been steadily and rapidly forging to the front as a source of our imports of wood pulp. The imports from Germany in 1906 exceeded those of 1905 by 28 per cent in value; those of 1907 exceeded those of 1906 by 92 per cent; those of 1908 exceeded those of 1907 by 77 per cent; those of 1909 exceeded those of 1908 by about 20 per cent; and those of 1910 exceeded those of 1909 by about 50 per cent. The figures for the last six months of 1910 indicate an uninterrupted continuance of this remarkable progression. If we consider the quantity of our imports of German pulp, instead of their value, the rate of progression is even more remarkable. Indeed, Germany is now the principal source of our imports of unbleached chemical pulp.

Canada's preeminence as a source of our imports of pulp is due to the fact that practically all of our imported mechanically ground pulp comes from that country, as well as a portion of our imports of unbleached chemical pulp. Our imports of unbleached chemical pulp, however, have increased with great rapidity since 1908. In that year we imported less than \$1,500,000 worth, whereas in 1909 we imported nearly \$4,500,000 worth, and in 1910 nearly \$6,000,000 worth of unbleached chemical pulp (see Table 38); and of this total Canada furnished in 1909 about 30 per cent, valued at \$1,334,820, and in 1910 only 21 per cent, valued at \$1,241,179.

Norway, like Germany, has been rapidly gaining ground as an exporter of pulp to the United States. Our imports from Norway,

however, consist largely of bleached chemical pulp. The changes from year to year in the importance of the four principal sources of our pulp imports are indicated by Table 37.

TABLE 37.—*Value of imports of wood pulp of all kinds, by years, from the principal countries of origin, 1905 to 1910, inclusive.*

From—	1905	1906	1907	1908	1909	1910
Canada.....	\$2,669,000	\$2,503,000	\$3,230,000	\$3,198,000	\$3,407,000	\$4,224,000
Germany.....	350,000	451,000	858,000	1,517,000	1,817,000	2,769,000
Norway.....	912,000	979,000	1,374,000	952,000	1,564,000	2,375,000
Sweden.....	396,000	461,000	499,000	1,060,000	1,318,000	1,641,000
Other countries.....	174,000	191,000	388,000	586,000	822,000	759,000
Total.....	4,501,000	4,585,000	6,349,000	7,313,000	8,627,000	11,768,000

IMPORTS OF UNBLEACHED CHEMICAL PULP.

If we differentiate the total imports of pulp, and consider each of the three kinds reported separately since 1908, it appears that the exporting nations rank differently, according to whether we consider mechanically ground pulp, bleached chemical pulp, or unbleached chemical pulp. The most important of the three varieties is unbleached chemical pulp, the imports of which in 1909 and 1910 amounted to approximately one-half our total imports of pulp. Of unbleached chemical pulp the imports in 1910 amounted to 374,576,834 pounds, valued at \$5,831,016. The principal countries of origin, as indicated in Table 38, were Germany, Sweden, Canada, and Norway. Germany furnished approximately one-third of the total imports and Sweden about one-fourth of the total imports of unbleached chemical pulp.

TABLE 38.—*Imports of unbleached chemical wood pulp for the fiscal years 1909 and 1910.*

[Duty, one-sixth of 1 cent per pound, dry weight.]

From—	1909		1910	
	Pounds.	Value.	Pounds.	Value.
Germany.....	77,496,148	\$1,298,682	116,266,741	\$1,826,268
Sweden.....	79,430,719	1,207,870	95,780,715	1,422,926
Canada.....	74,367,341	1,334,821	75,446,109	1,241,179
Norway.....	20,096,284	330,917	53,043,548	825,399
Other countries ¹	17,549,965	306,613	34,039,721	515,244
Total.....	268,940,457	4,478,903	374,576,834	5,831,016

¹ Of the "Other countries," European Russia is becoming important. In 1909 we imported from European Russia 6,713,918 pounds, valued at \$125,405.

IMPORTS OF BLEACHED CHEMICAL PULP.

Next in importance to our imports of unbleached chemical pulp those of bleached chemical pulp, which amounted during the year 1910 to 153,515,933 pounds, valued at \$3,394,273. Nearly half of this total came from Norway and was valued at \$1,747,000. Approximately one-fourth came from Germany—\$936,247. Of the remaining fourth, the largest portion is furnished by Canada, which sent us 19,345,312 pounds, valued at \$460,038. (See Table 39.)

TABLE 39.—*Imports of bleached chemical wood pulp for the fiscal years 1909 and 1910.*

[Duty, one-fourth of 1 cent per pound, dry weight.]

From—	1909		1910	
	Pounds.	Value.	Pounds.	Value.
Norway.....	46,043,771	\$1,128,958	71,652,708	\$1,544,407
Germany.....	20,886,461	517,738	41,639,963	936,247
Canada.....	4,607,983	120,162	19,345,312	460,038
Sweden.....	4,488,184	109,702	9,288,062	213,262
Other countries ¹	8,998,947	213,923	11,589,888	240,319
Total.....	85,025,346	2,090,483	153,515,933	3,394,273

¹ Of the "Other countries," Finland is acquiring importance as an exporter of pulp; for in 1909 we imported from European Russia (mainly Finland) 6,464,334 pounds, valued at \$155,664.

IMPORTS OF MECHANICAL PULP.

Our imports of mechanically ground pulp amounted in 1910 to over 319,000,000 pounds, valued at \$2,542,725. Far and away the most important country of origin was Canada, which furnished almost the entire amount of our imports of mechanically ground wood pulp, the other countries being insignificant in this regard. (See Table 40.)

TABLE 40.—*Imports of mechanically ground wood pulp for the fiscal years 1909 and 1910.*

[Free when imported from countries that have free and unrestricted exportation; otherwise a duty of one-twelfth of 1 cent per pound, dry weight, is imposed.]

From—	1909		1910	
	Pounds.	Value.	Pounds.	Value.
Canada.....	249,831,901	\$1,951,680	317,565,515	\$2,523,283
Germany.....	89,349	660	506,986	6,773
Sweden.....	Not given.	Not given.	481,534	4,437
Norway.....	10,198,916	104,030	470,892	5,078
Other countries.....	159,003	1,507	323,065	3,154
Total.....	260,279,169	2,057,877	319,347,992	2,542,725

Inasmuch as part of our imports of mechanically ground wood pulp is subject to duty and the remainder free, Table 41 has been added to indicate the relative importance in 1910 of the dutiable and free imports of this kind of pulp.

TABLE 41.—*Imports of mechanically ground wood pulp in 1910, dutiable and free of duty.*

From—	Free of duty.		Dutiable.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Canada.....	157,347,856	\$1,203,153	160,217,659	\$1,320,130	317,565,515	\$2,523,283
Germany.....	300,800	4,637	206,186	2,136	506,986	6,773
Sweden.....	56,000	737	425,534	3,700	481,534	4,437
Norway.....	410,860	4,197	60,032	881	470,892	5,078
Other countries.....	233,412	2,254	89,653	900	323,065	3,154
Total.....	158,348,928	1,214,978	160,999,064	1,327,747	319,347,992	2,542,725

PRICES OF IMPORTED CHEMICAL PULP IN 1910.

Whereas our imports of mechanically ground pulp come almost exclusively from Canada, Europe sends us almost exclusively chemical pulp. Our imports from Europe, in fact, consist very largely of bleached and unbleached sulphite pulp, and of a smaller quantity of unbleached sulphate pulp, there being practically no market in this country for imported bleached sulphate, and the importation of mechanically ground pulp from Europe being uncommon. It should be added that from Germany and Holland we import an inconsiderable quantity of straw pulp.

An investigation recently made by the Tariff Board among the principal pulp-importing concerns of the United States disclosed the fact that the imported chemical pulps vary greatly in price—some of the bleached sulphites in particular selling in this country at prices considerably in excess of those obtained for bleached sulphite of American manufacture. This is notably the case with regard to certain high-grade bleached sulphites. It appears that the grading of pulp is made with considerable care in Europe, and that in some instances the sulphite pulp designated abroad as No. 1 is superior to the grade similarly designated by some manufacturers of pulp in the United States. It may be said that certain varieties of imported pulp, notably the high-grade bleached sulphites, have no serious competition in the United States.

Imported sulphate pulp prepared by digesting wood with a mixture of sulphate of soda, caustic soda, and sulphide of soda is often miscalled *soda pulp*. Soda pulp is prepared by digesting wood—usually poplar wood—with caustic soda, and figures in our export trade but not among our imports.

The following table concerning the purchase prices and the selling prices of imported European chemical pulp for the calendar year 1910 were taken from the books of several American importers whose total sales of chemical pulp aggregated about 120,000 long tons in that year. It should be noted that the purchase price—the price paid by the importer—is almost invariably quoted c. i. f. New York, Philadelphia, Newport News, or other Atlantic seaport; that frequently this price is subject to discount if paid in less than 90 days; and that from the price quoted to the American importer there must be deducted, to get the net price to the manufacturer, the selling charges, packing, insurance, brokerage, inland freight to the European port of shipment, consular fees, and ocean freight. Upon the arrival of the pulp in New York or other Atlantic seaport, the duty and incidental dock and customhouse charges are then paid as a rule by the importer, and added, together with his profit, to determine the selling price ex dock Atlantic seaport. Should the price be quoted for goods delivered at the paper mill, the actual freight is usually added. Generally, however, the quoted price is ex dock New York or other Atlantic seaport, and for purposes of comparison all selling prices quoted in the following table have been reduced to an ex dock Atlantic seaport basis:

TABLE 42.—*Prices paid and received for chemical pulp imported from Europe in 1910.*

[Based on information furnished the Tariff Board by importers whose total imports of pulp from Europe constitute 59 per cent of the chemical pulp imported into the United States from Europe in 1910.]

Kind and grade of pulp.	Im- port- ers.	Countries of origin.	Prices paid by the importers.			Selling prices.	
			Highest price per 100 pounds, exclud- ing duty, c. i. f. Atlantic sea- port.	Lowest price per 100 pounds, exclud- ing duty, c. i. f. Atlantic sea- port.	Aver- age price per 100 pounds, exclud- ing duty, c. i. f. Atlantic sea- port.	Range of selling prices, duty paid, per 100 pounds, ex dock, Atlantic seaport.	Usual selling price, duty paid, per 100 pounds ex dock, Atlantic sea- port.
Unbleached sulphite No. 1.	O	Norway and Sweden.				\$1.925-\$2.22	\$2.00
Do.	A	Sweden and Hungary.	\$2.117	\$1.711	\$1.715	1.925-2.10	2.00
Do.	M	Sweden and Norway.	1.718	1.562	1.61	1.75-2.05	2.00
Do.	L	do.	1.629	1.548	1.60	1.90-2.10	1.95
Do.	P	do.				1.825-2.00	1.95
Do.	G	Sweden and Finland.	1.81	1.589	1.688	1.825-2.05	1.95
Unbleached sulphite No. 2.	C	Sweden and Austria.	1.71	1.58	1.655	1.765-1.925	1.85
Do.	O	Austria.				1.80-2.075	1.90
Do.	D	Sweden and Norway.	1.67	1.38	1.545	1.55-1.90	1.80
Unbleached sulphite No. 3.	F	do.	1.52	1.33	1.38	1.65-1.84	1.72
Do.	P	do.				1.525-1.85	1.70
Do.	O	Austria.				1.45-1.975	1.725
Do.	K	Sweden and Austria.	1.40	1.34	1.37	1.495-1.73	1.64
Bleached sulphite No. 1.	R	Austria.			2.41		2.90
Do.	A	Sweden and Norway.	2.607	2.173	2.328	2.70-2.90	2.75
Do.	E	do.			2.18	2.45-2.875	2.60
Do.	H	Germany.			2.613		2.975
Bleached sulphite No. 2.	A	Sweden and Norway.	2.444	2.2365	2.243	2.60-2.80	2.60
Do.	P	do.				2.40-2.70	2.525
Do.	G	do.	2.2267	2.01	2.092	2.45-2.60	2.50
Do.	B	Germany.			2.124		2.50
Do.	G	Sweden and Norway.	2.254	1.955	2.037	2.35-2.55	2.40
Do.	M	do.			2.00	2.36-2.52	2.45
Mitscherlich sulphite, unbleached.	O	Germany.				2.025-2.475	2.05
Do.	L	do.	1.684	1.625	1.64	1.865-2.02	1.97
Mitscherlich sulphite, bleached.	P	do.				2.90-3.00	2.95
Ritter Kellner sulphite, unbleached.	F	do.				2.05-2.15	2.05
Ritter Kellner sulphite, bleached.	Q	do.				2.575-2.975	2.75
Unbleached sulphate No. 1.	Q	Sweden and Norway.				1.70-2.075	2.00
Do.	N	Sweden and Finland.	1.629	1.52	1.545	1.825-2.025	1.85
Do.	K	Sweden.	1.72	1.53	1.538	1.65-1.92	1.82
Do.	L	do.	1.643	1.50	1.575	1.93-2.03	1.98
Unbleached sulphate No. 2.	D	do.	1.36	1.329	1.343	1.165-1.72	1.72
Bleached sulphate No. 1.	O	Sweden and Norway.				2.40-2.80	2.50

PART XIII.

WAGES AND HOURS OF LABOR IN THE PULP AND PAPER INDUSTRY.

(A) CLASSIFICATION OF WAGES, BY SPEED AND SIZE OF MACHINES, ALLOTMENT OF TASK, ETC.

Rates of wages in many occupations depend on the productivity of the labor performed, or, as in the case of machine help, on the speed of the machine, width of trimmed roll, etc.

A classification scheme quite general in its application in eastern mills is herewith presented for 1910. While all the rates, grades, and classifications presented would not be found in any one mill, each is found in some mill.

Not all the employees are affected by this "sliding scale"; it applies in fact only to the principal occupations as a rule. For instance, in pulp mills, only the head grinderman has his rate per hour fixed upon the normal production of the plant; the grindermen and the block handlers have a flat rate. In the sulphite plants the acid maker, cook, and first assistant cook have a "sliding scale" based upon production. In the paper mill the machine tender, back tender, or second hand, and occasionally the third hand, have an hourly rate based upon speed of machine in feet per minute and the width of trim of finished roll; as these factors determine the tons produced it amounts, of course, to a wage rate based on normal tonnage capacity. Bonus and premium plans based on production in excess of normal is likewise paid to the leading occupations only when bonuses prevail. That is to say, on a Fourdrinier which is rated at 40 tons per day \$1 per ton bonus is paid for output in excess of 40 tons, but this bonus is divided only between machine tender and back tender.

With this as a key to these rate classifications, it is believed that anyone sufficiently interested can use the following tables. In so far as the matter of organized labor is pertinent to this question, it should be stated that less than a dozen news-print paper plants in the United States, and these all in the Eastern States, have written and signed wage agreements with the unions; but in practically all plants where this classification and these rates obtain, an unwritten understanding and tacit arrangement exists with union labor without going to the extent of official recognition of it.

Company

Rating

Wood handler
Conveyor man
Scaler
Blip man
Teamster

Engineer

Tractor

Wagon

Head wood handler
Blip man
Teamster

Company

Head wood handler

Wood handler

Conveyor man

Scaler

Blip man

Teamster

Conveyor boy

The head wood handler is classified _____
per day, this number being the normal _____
determined by cords handled per hour.

10
94

10
15

TABLE 45.—Wood room: 1910.

Occupations.	Class.	Tonnage of rough cords daily.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Head preparer.....	A	0	40	9	\$0.23	\$2.07	8	\$0.26	\$2.08
	B	40	80	9	.24	2.16	8	.27	2.16
	C	80	120	9	.25	2.25	8	.28	2.24
	D	120	160	9	.26	2.34	8	.29	2.32
	E	160	200	9	.27	2.43	8	.30	2.40
	F	200	240	9	.28	2.52	8	.31	2.48
	G	240	280	9	.29	2.61	8	.32	2.56
	H	280	320	9	.30	2.70	8	.33	2.64
	I	320	360	9	.31	2.79	8	.34	2.72
	J	360	400	9	.32	2.88	8	.35	2.80
	K	400	440	9	.33	2.97	8	.36	2.88
	L	440	480	9	.34	3.06	8	.37	2.96
	M	480	520	9	.35	3.15	8	.38	3.04
Wood handler.....				9	.19	1.71	8	.22	1.76
Conveyor men.....				9	.19	1.71	8	.22	1.76
Sawyer.....				9	.21	1.89	8	.24	1.92
Barker.....				9	.20	1.80	8	.23	1.84
Splitter.....				9	.19	1.71	8	.22	1.76
Chipper.....				9	.20	1.80	8	.23	1.84
Chip bin.....				9	.19	1.71	8	.22	1.76
Knotter.....				9	.19	1.71	8	.22	1.76
Waste handler.....				9	.19	1.71	8	.22	1.76

The head preparer is classified according to the number of rough cords he has charge of preparing per day, this number being the normal amount of wood consumed by the mill. If tour work, his class is determined by cords prepared per tour.

TABLE 46.—Grinders: 1910.

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Head grinderman.....	A	0	20	9	\$0.21	\$1.89	8	\$0.24	\$1.92
	B	20	40	9	.22	1.98	8	.25	2.00
	C	40	60	9	.23	2.07	8	.26	2.08
	D	60	80	9	.24	2.16	8	.27	2.16
	E	80	100	9	.25	2.25	8	.28	2.24
	F	100	120	9	.26	2.34	8	.29	2.32
	G	120	140	9	.27	2.43	8	.30	2.40
	H	140	160	9	.28	2.52	8	.31	2.48
	I	160	180	9	.29	2.61	8	.32	2.56
	J	180	200	9	.30	2.70	8	.33	2.64
	K	200	220	9	.31	2.79	8	.34	2.72
	L	220	240	9	.32	2.88	8	.35	2.80
	M	240	260	9	.33	2.97	8	.36	2.88
Grinderman:									
Paper plants.....							8	.23	1.84
Pulp mills.....							8	.22	1.76
Block handler:									
Paper plants.....				9	.19	1.71	8	.22	1.76
Pulp mills.....				9	.19	1.71	8	.21	1.68

The head grinderman is classified by the normal production of ground-wood mills.

TABLE 47.—*Ground-wood screens: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Screenman:									
Paper plants.....							8	\$0.23	\$1.84
Pulp mills.....							8	.23	1.76
Shiverman:									
Paper plants.....							8	.22	1.76
Pulp mills.....							8	.21	1.68

TABLE 48.—*Ground-wood presses: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Head pressman.....	{ A B C	0	80	9	\$0.22	\$1.98	8	\$0.25	\$2.00
		80	160	9	.23	2.07	8	.26	2.08
		160	240	9	.24	2.16	8	.27	2.16
Pressmen:									
Paper plants.....							8	.23	1.84
Pulp mill.....							8	.22	1.76
Deckerman.....							8	.23	1.84

The head pressman is classified according to the normal production of ground-wood mills.

TABLE 49.—*Acid plant: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Sulphur burner.....	{ A B C D	0	40	9	\$0.25	\$2.25	8	\$0.22	\$1.76
		40	80	9	.26	2.34	8	.28	2.24
Acid maker.....		80	120	9	.27	2.43	8	.30	2.32
		120	160	9	.28	2.52	8	.31	2.48
Lime slaker.....							8	.22	1.76
Lime handler.....				9	.19	1.71			
Towerman.....				9	.19	1.71			

The acid maker is classified according to the normal production of the sulphite mill.

TABLE 50.—*Digesters: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Cook.....	A	0	20	.....	.....	.....	8	\$0.31	\$2.48
	B	20	40	.....	.....	.....	8	.32	2.56
	C	40	60	.....	.....	.....	8	.33	2.64
	D	60	80	.....	.....	.....	8	.34	2.72
	E	80	100	.....	.....	.....	8	.35	2.80
	F	100	120	.....	.....	.....	8	.36	2.88
	G	120	140	.....	.....	.....	8	.37	2.96
First helper.....	A	0	20	.....	.....	.....	8	.23	1.84
	B	20	40	.....	.....	.....	8	.24	1.92
	C	40	60	.....	.....	.....	8	.25	2.00
	D	60	80	.....	.....	.....	8	.26	2.08
	E	80	100	.....	.....	.....	8	.27	2.16
	F	100	120	.....	.....	.....	8	.28	2.24
	G	120	140	.....	.....	.....	8	.29	2.32
Second helper.....				.....	.....	.....	8	.22	1.76
Blow-pit man.....				.....	.....	.....	8	.22	1.76

Cooks and first helpers are classified according to the normal production of the sulphite mill. There is to be 1 cook per shift in each mill.

TABLE 51.—*Sulphite screens: 1910.*

Occupation.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Screen man.....				8	\$0.23	\$1.64

TABLE 52.—*Sulphite presses: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Head pressman.....	A	0	20	9	\$0.22	\$1.98	8	\$0.25	\$2.00
	B	20	40	9	.23	2.07	8	.26	2.08
	C	40	60	9	.24	2.16	8	.27	2.16
	D	60	80	9	.25	2.25	8	.28	2.24
	E	80	100	9	.26	2.34	8	.29	2.32
	F	100	120	9	.27	2.43	8	.30	2.40
	G	120	140	9	.28	2.52	8	.31	2.48
Pressman.....				9	.29	2.61	8	.32	2.56
Decker man.....				9	.20	1.80	8	.23	1.84

The head pressman is classified according to the normal production of the sulphite mill.

TABLE 53.—*Beaters: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Head beaterman.....	A	0	40	9	\$0.27	\$2.43	8	\$0.30	\$2.40
	B	40	80	9	.28	2.52	8	.31	2.48
	C	80	120	9	.29	2.61	8	.32	2.56
	D	120	160	9	.30	2.70	8	.33	2.64
	E	160	200	9	.31	2.79	8	.34	2.72
	F	200	240	9	.32	2.88	8	.35	2.80
	G	240	280	9	.33	2.97	8	.36	2.88
Beaterman.....							8	.23	1.84
Clay and size man.....				9	.19	1.71	8	.22	1.76

The head beaterman is classified according to the normal production of the paper mill.

TABLE 54.—*Paper machines: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Machine tender.....	A						8	\$0.40	\$3.20
	B						8	.41	3.28
	C						8	.42	3.36
	D						8	.43	3.44
	E						8	.44	3.52
	F						8	.45	3.60
	G						8	.46	3.68
	H						8	.47	3.76
	I						8	.48	3.84
	J						8	.49	3.92
	K						8	.50	4.00
	L						8	.51	4.08
	M						8	.52	4.16
	N						8	.53	4.24
Second hand.....	A						8	.24	1.92
	B						8	.25	2.00
	C						8	.26	2.08
	D						8	.27	2.16
	E						8	.28	2.24
	F						8	.29	2.32
	G						8	.30	2.40
	H						8	.31	2.48
	I						8	.32	2.56
	J						8	.33	2.64
	K						8	.34	2.72
	L						8	.35	2.80
	M						8	.36	2.88
	N						8	.37	2.96

Machines running on wrappers permanently pay 3 cents per hour less than above for machine tenders and back tenders.

TABLE 55.—*Paper machines: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Third hand.....	(C)	.....	.....	.....	.....	.....	8	\$0.23	\$1.84
	(D)	.....	.....	.....	.....	.....	8	.23	1.84
	(E)	.....	.....	.....	.....	.....	8	.24	1.92
	(F)	.....	.....	.....	.....	.....	8	.25	2.00
	(G)	.....	.....	.....	.....	.....	8	.26	2.08
	(H)	.....	.....	.....	.....	.....	8	.27	2.16
Fourth hand.....	(I)	.....	.....	.....	.....	.....	8	.28	2.24
Fifth hand.....	(J)	.....	.....	.....	.....	.....	8	.28	1.84
Sixth hand.....	(K)	.....	.....	.....	.....	.....	8	.22	1.76
	(L)	.....	.....	.....	.....	.....	8	.22	1.76
	(M)	.....	.....	.....	.....	.....	8	.22	1.76
	(N)	.....	.....	.....	.....	.....	8	.22	1.76

¹ Classes A to D, inclusive.

² Classes E to J, inclusive (3 men on machine).

³ Classes E to J, inclusive (4 men on machine).

TABLE 56.—*Basis for classes.*

Classes.	Speed under 300 feet per minute.		Speed, 300 to 400 feet per minute.		Speed, 400 to 500 feet per minute.		Speed, 500 feet per minute and upward.	
	Trim.		Trim.		Trim.		Trim.	
	From—	To—	From—	To—	From—	To—	From—	To—
A.....	Inches. 50	Inches. 60	Inches. 40	Inches. 50	Inches. 30	Inches. 40	Inches. 20	Inches. 30
B.....	60	70	50	60	40	50	30	40
C.....	70	80	60	70	50	60	40	50
D.....	80	90	70	80	60	70	50	60
E.....	90	100	80	90	70	80	60	70
F.....	100	110	90	100	80	90	70	80
G.....	110	120	100	110	90	100	80	90
H.....	120	130	110	120	100	110	90	100
I.....	130	140	120	130	110	120	100	110
J.....	140	150	130	140	120	130	110	120
K.....	150	160	140	150	130	140	120	130
L.....	160	170	150	160	140	150	130	140
M.....	170	180	160	170	150	160	140	150
N.....	180	190	170	180	160	170	150	160

TABLE 57.—*Finishing: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Head finisher.....	A	0	40	9	\$0.25	\$2.25			
	B	40	80	9	.27	2.43			
	C	80	120	9	.29	2.61			
	D	120	160	9	.31	2.79			
	E	160	200	9	.33	2.97			
	F	200	240	9	.35	3.15			
Roll finisher.....				9	.20	1.80			
Sheet finisher.....	A			9	.22	1.98			
	B			9	.23	2.07			
	C			9	.24	2.16			
Counter:									
Man.....				9	.19	1.71			
Girl.....				9	.14	1.26			
Cutter:									
Man.....				9	.20	1.80			
Girl.....				9	.14	1.26			
Rewinder.....				9	.19	1.71			
Weigher.....	A			9	.22	1.98			
	B			9	.23	2.07			
	C			9	.24	2.16			
Marker.....				9	.20	1.80			
First baler.....				9	.20	1.80			
Baler.....				9	.19	1.71			
Caser.....				9	.19	1.71			

The head finisher is classified according to the normal production of paper mills. If the mill makes sheets the grade of the head finisher can be advanced one class. Sheet finishers and weighers are classified according to efficiency.

TABLE 58.—*Indoor miscellaneous: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Head paper loader.....	A	0	40	9	\$0.22	\$1.98			
	B	40	80	9	.23	2.07			
	C	80	120	9	.24	2.16			
	D	120	160	9	.25	2.25			
	E	160	200	9	.26	2.34			
	F	200	240	9	.27	2.43			
	G	240	280	9	.28	2.52			
Paper loader.....				9	.20	1.80			
Stock handler:									
Paper plants.....				9	.19	1.71	8	\$0.22	\$1.76
Pulp mills.....				9	.19	1.71	8	.21	1.68
Weigher.....				9	.19	1.71	8	.22	1.76
Car man.....				9	.19	1.71			
Oil keeper.....				9	.20	1.80			
Oiler.....				9	.19	1.71	8	.22	1.76
Cleaner.....				9	.19	1.71			
Filter man.....				9	.19	1.71	8	.22	1.76
Night watchman.....				13	.20	2.60			
Sunday watchman.....				11	.22	2.42			
Elevator man.....				9	.19	1.71	8	.22	1.76
Felt man.....				9	.19	1.71			
First core cleaner.....				9	.20	1.80			
Core cleaner.....				9	.19	1.71			
Sampler.....				9	.19	1.71			
Stock saver.....				9	.19	1.71	8	.22	1.76
First power-house man.....				9	.34	3.06	8	.37	2.96
Second power-house man.....							8	.28	2.24
Printer.....				9	.22	1.98			

The head paper loader is classified according to the normal production of paper mill.

TABLE 59.—Outdoor miscellaneous: 1910.

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Racks.....				9	\$0.19	\$1.71	8	\$0.22	\$1.76
Barn boss.....				9	.20	1.80			
Teamster.....				10	.19	1.90			
First laborer.....	A			9	.20	1.80			
	B			9	.21	1.89			
	C			9	.22	1.98			
	D			9	.23	2.07			
	E			9	.24	2.16			
	F			9	.25	2.25			
Laborer.....				9	.19	1.71	8	.22	1.76
Gatekeeper.....				9	.19	1.71			

The first laborer is classified according to the importance of the position.

TABLE 60.—Steam plant: 1910.

Occupations.	Class.	Horsepower of engines.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Engineer ¹	A	0	200				8	\$0.26	\$2.08
	B	200	400				8	.27	2.16
	C	400	600				8	.28	2.24
	D	600	800				8	.29	2.32
	E	800	1,000				8	.30	2.40
	F	1,000	1,200				8	.31	2.48
	G	1,200	1,400				8	.32	2.56
	H	1,400	1,600				8	.33	2.64
	I	1,600	1,800				8	.34	2.72
	J	1,800	2,000				8	.35	2.80
Engine oiler.....							8	.22	1.76
Dynamo man ²	A	0	400	9	\$0.20	\$1.80	8	.23	1.84
	B	400	800	9	.21	1.89	8	.24	1.92
	C	800	1,200	9	.22	1.98	8	.25	2.00
	D	1,200	1,600	9	.23	2.07	8	.26	2.08
	E	1,600	2,000	9	.24	2.16	8	.27	2.16
	F	2,000	2,400	9	.25	2.25	8	.28	2.24
Head fireman ³							8	.30	2.40
First fireman ⁴							8	.28	2.24
Coal fireman.....				8	.25	2.00	8	.25	2.00
Wood fireman.....				8	.25	2.00	8	.25	2.00
Coal handler.....				8	.22	1.76	8	.22	1.76
Wood handler.....				8	.22	1.76	8	.22	1.76
Ash handler.....				8	.22	1.76	8	.22	1.76
Boiler cleaner.....				9	.25	2.25			

¹ Classified by indicated horsepower of engines.

² Classified by capacity in kilowatts of dynamos.

³ In charge of 10 boilers or more.

⁴ In charge of less than 10 boilers.

TABLE 61.—*Repairs: 1910.*

Occupations.	Class.	Tonnage.	Daywork.			Tour work.		
			Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Head machinist.....	A	Minimum to maximum.	9	\$0.35	\$3.15			
	B		9	.36	3.24			
	C		9	.37	3.33			
	D		9	.38	3.42			
	E		9	.39	3.51			
	F		9	.40	3.60			
	G		9	.41	3.69			
	H		9	.42	3.78			
	I		9	.43	3.87			
	J		9	.44	3.96			
	A		9	.25	2.25			
	B		9	.26	2.34			
	C		9	.27	2.43			
	D		9	.28	2.52			
Machinist.....	E	do.	9	.29	2.61			
	F		9	.30	2.70			
	G		9	.31	2.79			
	H		9	.32	2.88			
	I		9	.33	2.97			
	J		9	.34	3.06			
	A		9	.20	1.80			
	B		9	.21	1.89			
	C		9	.22	1.98			
	D		9	.23	2.07			
	E		9	.24	2.16			
	A		9	.33	2.97			
	B		9	.34	3.06			
	C		9	.35	3.15			
Head millwright.....	D	do.	9	.36	3.24			
	E		9	.37	3.33			
	F		9	.38	3.42			
	G		9	.39	3.51			
	H		9	.40	3.60			
	A		9	.25	2.25			
	B		9	.26	2.34			
	C		9	.27	2.43			
	D		9	.28	2.52			
	E		9	.29	2.61			
	F		9	.30	2.70			
	G		9	.31	2.79			
	H		9	.32	2.88			
	A		9	.20	1.80			
Millwright helper.....	B	do.	9	.21	1.89			
	C		9	.22	1.98			
	D		9	.23	2.07			
	E		9	.24	2.16			
	A		9	.24	2.16			
	B		9	.25	2.25			
	C		9	.26	2.34			
	D		9	.27	2.43			
	E		9	.28	2.52			
	F		9	.29	2.61			
	G		9	.30	2.70			
	A		9	.32	2.88			
	B		9	.33	2.97			
	C		9	.34	3.06			
Head piper.....	D	do.	9	.35	3.15			
	E		9	.36	3.24			
	F		9	.37	3.33			
	G		9	.38	3.42			
	A		9	.24	2.16			
	B		9	.25	2.25			
	C		9	.26	2.34			
	D		9	.27	2.43			
	E		9	.28	2.52			
	F		9	.29	2.61			
	G		9	.30	2.70			
	A		9	.26	2.34			
	B		9	.27	2.43			
	C		9	.28	2.52			
Steamfitter.....	D	do.	9	.29	2.61			
	E		9	.30	2.70			
	A		9	.26	2.34			
	B		9	.27	2.43			

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TABLE 61.—*Repairs: 1910*—Continued.

Occupations.	Class.	Tonnage.	Daywork.			Tour work	
			Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.
Blacksmith.....	A	Minimum to maximum.	9	\$0.26	\$2.34	.....	.....
	B		9	.27	2.43	.....	.....
	C		9	.28	2.52	.....	.....
	D		9	.29	2.61	.....	.....
	E		9	.30	2.70	.....	.....
	F		9	.31	2.79	.....	.....
	G		9	.32	2.88	.....	.....
	H		9	.33	2.97	.....	.....
	I		9	.34	3.06	.....	.....
Blacksmith helper.....	A	do.....	9	.20	1.80	.....	.....
	B		9	.21	1.89	.....	.....
	C		9	.22	1.98	.....	.....
	D		9	.23	2.07	.....	.....
	E		9	.24	2.16	.....	.....
	A		9	.28	2.52	.....	.....
	B		9	.29	2.61	.....	.....
	C		9	.30	2.70	.....	.....
	D		9	.31	2.79	.....	.....
Mason.....	E	do.....	9	.32	2.88	.....	.....
	F		9	.33	2.97	.....	.....
	G		9	.34	3.06	.....	.....
	H		9	.35	3.15	.....	.....
	I		9	.36	3.24	.....	.....
Mason helper.....	A	do.....	9	.20	1.80	.....	.....
	B		9	.22	1.98	.....	.....
	C		9	.23	2.07	.....	.....
	D		9	.24	2.16	.....	.....
	E		9	.25	2.25	.....	.....
	F		9	.26	2.34	.....	.....
	G		9	.27	2.43	.....	.....
	A		9	.28	2.52	.....	.....
	B		9	.20	1.80	.....	.....
Painter.....	C	Minimum to maximum.	9	.26	2.34	.....	.....
	D		9	.27	2.43	.....	.....
	E		9	.28	2.52	.....	.....
	F		9	.29	2.61	.....	.....
	G		9	.30	2.70	.....	.....
Painter helper.....	A	do.....	9	.20	1.80	.....	.....
	B		9	.21	1.89	.....	.....
	C		9	.22	1.98	.....	.....
	D		9	.23	2.07	.....	.....
	E		9	.24	2.16	.....	.....
	F		9	.25	2.25	.....	.....
	G		9	.26	2.34	.....	.....
	A		9	.27	2.43	.....	.....
	B		9	.28	2.52	.....	.....
Roll grinder.....	C	Minimum to maximum.	9	.29	2.61	.....	.....
	D		9	.30	2.70	.....	.....
	E		9	.31	2.79	.....	.....
	F		9	.32	2.88	.....	.....
	G		9	.33	2.97	.....	.....
Knife grinder.....	A	do.....	9	.20	1.80	.....	.....
	B		9	.21	1.89	.....	.....
	C		9	.22	1.98	.....	.....
	D		9	.23	2.07	.....	.....
	E		9	.24	2.16	.....	.....
	F		9	.25	2.25	.....	.....
	G		9	.26	2.34	.....	.....
	A		9	.27	2.43	.....	.....
	B		9	.28	2.52	.....	.....
Saw filer.....	C	do.....	9	.29	2.61	.....	.....
	D		9	.30	2.70	.....	.....
	E		9	.31	2.79	.....	.....
	F		9	.32	2.88	.....	.....
	G		9	.33	2.97	.....	.....
Draftsman.....	A	do.....	9	.20	1.80	.....	.....
	B		9	.21	1.89	.....	.....
	C		9	.22	1.98	.....	.....
	D		9	.23	2.07	.....	.....
	E		9	.24	2.16	.....	.....
	F		9	.25	2.25	.....	.....
	G		9	.26	2.34	.....	.....
	A		9	.27	2.43	.....	.....
	B		9	.28	2.52	.....	.....
Electrician.....	C	do.....	9	.29	2.61	.....	.....
	D		9	.30	2.70	.....	.....
	E		9	.31	2.79	.....	.....
	F		9	.32	2.88	.....	.....
	G		9	.33	2.97	.....	.....
	H		9	.34	3.06	.....	.....
	I		9	.35	3.15	.....	.....
	A		9	.36	3.24	.....	.....
	B		9	.37	3.33	.....	.....
Lead burner.....	C	do.....	9	.38	3.42	.....	.....
	D		9	.39	3.51	.....	.....
	E		9	.40	3.60	.....	.....
	F		9	.41	3.69	.....	.....
	G		9	.42	3.78	.....	.....
	A		9	.43	3.87	.....	.....
	B		9	.44	3.96	.....	.....
	C		9	.45	4.05	.....	.....
	D		9	.46	4.14	.....	.....
Lead burner helper.....	E	do.....	9	.47	4.23	.....	.....
	F		9	.48	4.32	.....	.....
	G		9	.49	4.41	.....	.....
	A		9	.50	4.50	.....	.....
	B		9	.51	4.59	.....	.....
	C		9	.52	4.68	.....	.....
	D		9	.53	4.77	.....	.....
	E		9	.54	4.86	.....	.....
	F		9	.55	4.95	.....	.....
Laborer.....	G	do.....	9	.56	5.04	.....	.....
	H		9	.57	5.13	.....	.....

Head men are classified according to the number of repair men in their crew and all others in the section according to their efficiency.

TABLE 62.—*Railroad operation: 1910.*

Occupations.	Class.	Tonnage.		Day work.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Engineer.....				9	\$0.28	\$2.52			
Fireman.....				9	.21	1.89			
Trainman.....				9	.21	1.89			
First trackman.....				9	.23	2.07			
Trackman.....				9	.19	1.71			
Gate tender.....				9	.13	1.17			
Car repairer.....				9	.24	2.16			

TABLE 63.—*Screen plates: 1910.*

Occupations.	Class.	Tonnage.	Day work.			Tour work.		
			Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Head plate cutter.....	A	Minimum to maximum.	9	\$0.25	\$2.25			
	B		9	.26	2.34			
	C		9	.27	2.43			
	D		9	.28	2.52			
	E		9	.29	2.61			
	F		9	.30	2.70			
	G		9	.31	2.79			
	H		9	.32	2.88			
Plate cutter.....	A	...do.....	9	.20	1.80			
	B		9	.21	1.89			
	C		9	.22	1.98			
	D		9	.23	2.07			
	E		9	.24	2.16			

TABLE 64.—*Core machines: 1910.*

Occupations.	Class.	Tonnage.		Daywork.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
First core maker.....				9	\$0.20	\$1.80			
Core maker.....				9	.19	1.71			

TABLE 65.—*Cotton waste: 1910.*

Occupations.	Class.	Tonnage.		Daywork.			Tour work.		
		From—	To—	Hours per day.	Rate per hour.	Daily wages.	Hours per tour.	Rate per hour.	Daily wages.
Head cotton-waste man.....				9	\$0.25	\$2.25			
Cuttermen.....				9	.19	1.71			
Bollerman.....				9	.19	1.71			
Washerwoman.....							8	\$0.23	\$1.84

(B). RATES OF WAGES AND HOURS OF EMPLOYMENT.

SCOPE OF INVESTIGATION.

Information relative to wages and hours of labor in the wood-pulp and news-print paper industry has been secured from 50 companies or firms operating 165 mills in the United States and Canada. Of the 38 companies located in the United States, 27 are in the Eastern States, 10 are in the Lake States, and 1 company has a plant or plants in both geographical divisions.

In the following table the ground-wood, sulphite, and news-print paper mills for which information has been secured are shown by localities:

TABLE 66.—*Mills for which information was secured, by product and geographical division.*

Mills.	Eastern States.	Lake States.	Canada.	United States and Canada.
Ground wood pulp.....	54	13	13	80
Sulphite fiber.....	25	6	5	36
News-print paper.....	33	9	7	49
Total.....	112	28	25	165

It will be noted that the number of mills for which data as to wages and hours of labor have been secured is slightly larger than the number included in the tables showing cost of production. A number of mills producing ground wood pulp and sulphite fiber to be used for purposes other than the manufacture of news-print paper, and a number of paper mills producing news-print paper only as a secondary product, have been omitted from the cost tables. This has been done because the cost of production in these mills differs somewhat from the cost of production in mills manufacturing only news-print paper, or pulp or fiber to be made into news-print paper. There is, however, no corresponding difference in conditions affecting labor, and for this reason data as to wages and hours of labor are presented for all the ground wood, sulphite, and news-print paper mills for which information had been secured.

CLASSIFICATION AND PRESENTATION OF DATA.

For the purpose of presenting the data the employees are classified by selected occupations and by groups of occupations. In collecting wage statistics the practice was followed of using one schedule for an entire plant. A large proportion of the plants visited manufacture more than one product, and for this reason it is impossible, in many instances, to distinguish between employees working upon one product and those working upon another. Certain occupations are found only in a single branch of the industry. Grindermen, for example, are employed only in the ground-wood mills, chippers, digester cooks and acid makers only in the sulphite mills, and machine tenders, back

tenders, and the other members of the machine crew only in the news-print paper mills. On the other hand, certain occupations are common to two or more branches of the industry. Where men in these occupations are reported in a mill manufacturing two or more products, it is impossible to determine whether they are employed in the manufacture of one product or of another. Among the employees in occupations which can not be classified exactly by product may be mentioned barkermen, screenmen, and wet-machine tenders in mills manufacturing both ground wood pulp and sulphite fiber, and engineers, firemen, and laborers in mills manufacturing both pulp and paper.

In view of these facts, it is impossible, in presenting statistics relative to wages and hours of labor, to classify employees according to the branch of the industry in which they are employed. It is known, however, that the wages in a given occupation are not materially affected by the character of the product. In the case of two barkermen working in a given plant, one in the ground-wood mill, and the other in the sulphite mill, there will in most instances be little difference in the hourly wages paid. The same is true of screenmen, and pressmen in plants making ground-wood pulp and sulphite fiber and of engineers, firemen, and laborers in plants making both pulp and news-print paper. The plan has therefore been adopted of classifying the different pulp and paper occupations in groups according to the branch or branches of the industry in which they are found. The groups are five in number and are as follows: (1) Occupations in ground-wood mills; (2) occupations in sulphite mills; (3) occupations common to ground-wood and sulphite mills; (4) occupations in news-print paper mills; (5) occupations common to pulp and paper mills.

While every occupation in the pulp and paper industry might be included in one or another of the above groups, the data have been tabulated only for the principal occupations in each group. In the mills for which schedules have been secured there are over a hundred different occupations. The number of employees in many of these occupations is, however, small, and there is found to be considerable variation in occupations between the different mills, even in cases where the same product is manufactured. This variation may be due in part to the fact that an occupation known by a certain name in one mill may be known by a different name in another mill. The occupations for which data have been tabulated have been selected as representative and characteristic occupations of the industry. A large proportion of the employees for whom information was secured in all of the three localities included in the investigation are in these occupations. The different occupations selected are shown in connection with the detailed statistics for each group of occupations.

The data relative to labor conditions will be presented in six general divisions. In the first of these divisions will be included data as to wages, hours of labor, and nativity of employees for the industry as a whole. Tabulations relative to sex are not presented for the reason that males are almost exclusively employed in the branches of the industry studied. Each of the following five divisions will contain the data for a single group of occupations.

All of the information secured has been classified according to locality. An effort has been made to present the data in such a way

as to facilitate a comparison of conditions in the Eastern States and Lake States with conditions in Canada. With this end in view, all the wage data secured have been reduced to an hourly basis.

INDUSTRY AS A WHOLE.

Among employees in the wood-pulp and news-print paper industry the proportion of females is less than 2 per cent.

There were in the mills for which schedules have been secured 17,416 male employees. Of these employees, 12,054 were in mills in the Eastern States, 2,344 in mills in the Lake States, and 3,018 in Canadian mills. Male employees are classified, in the following table, by geographical division and general occupation.

TABLE 67.—*Male employees for whom information was secured by general occupation and geographical division.*

General occupation.	Eastern States.	Lake States.	Canada.	United States and Canada.
Occupations:				
In ground-wood mills.....	648	117	264	1,029
In sulphite mills.....	310	45	61	416
Common to ground-wood and sulphite mills.....	939	187	511	1,637
In news-print paper mills.....	2,078	300	320	2,698
Common to pulp and paper mills.....	2,308	684	401	3,393
Total.....	6,283	1,333	1,557	9,173
All other occupations.....	5,771	1,011	1,461	8,243
Grand total.....	12,054	2,344	3,018	17,416

In the course of its investigation the Tariff Board has secured original data relative to the nativity of 7,745 employees, of whom 6,811 are in mills in the Eastern States, and 934 in mills in the Lake States. The figures are presented in the following table:

TABLE 68.—*Nativity of employees.*

Country of birth.	Eastern States.	Lake States.	Total.	Country of birth.	Eastern States.	Lake States.	Total.
United States.....	3,923	485	4,408	Greece.....	12	.....	12
Canada.....	1,156	47	1,203	Finland.....	11	.....	11
Russia.....	341	61	402	Turkey.....	10	.....	10
Italy.....	320	6	326	Belgium.....	.....	6	6
Ireland.....	274	2	276	Switzerland.....	2	2	4
Austria.....	160	111	271	Bohemia.....	.....	3	3
Poland.....	197	12	209	Luxemburg.....	.....	3	3
Germany.....	53	102	155	Wales.....	2	.....	2
England.....	93	3	96	Austria-Hungary.....	1	.....	1
Holland.....	.....	49	49	Bavaria.....	.....	1	1
Sweden.....	28	21	49	Brazil.....	1	.....	1
Prince Edward Island.....	48	.....	48	Cuba.....	1	.....	1
Nova Scotia.....	37	.....	37	Newfoundland.....	1	.....	1
Hungary.....	35	1	36	Prussia.....	1	.....	1
Syria.....	30	.....	30	Sicily.....	1	.....	1
Scotland.....	25	2	27	South America.....	1	.....	1
France.....	25	1	26				
Norway.....	7	13	20				
Denmark.....	15	3	18				
				Total.....	6,811	934	7,745

Of the 7,745 employees for whom data are presented in the table, 4,408, or about 57 per cent, are of native birth. It will be noted that over one-third of the foreign-born employees are of Canadian nativity. The number of employees from the countries of southern and eastern Europe slightly exceeds the number of Canadians.

Data secured in 1909 by the United States Immigration Commission, which have been placed at the disposal of the Tariff Board, show a smaller proportion of foreign-born employees than has been indicated above. The proportion of Canadian employees among the foreign-born was found to be about the same by the Immigration Commission as by the Tariff Board, but the returns of the Immigration Commission disclose a somewhat larger proportion of southern and eastern Europeans than do the data secured by the Tariff Board. This difference is probably due to the more limited scope of the former investigation.

Employees in paper and pulp mills in the localities included in the investigation may conveniently be divided into two general groups—shift workers and day workers. Among the shift workers are included those operatives employed on or about the machinery of the paper mill which, in order to secure the greatest possible economy of production, must be kept in continuous operation. The members of the machine crew, the grinders, the barkers, the beaters, the engineers, the oilers, and the firemen, and men in occupations of a similar nature work in most mills by the shift.

The day workers are those employees engaged in work which does not have to be carried on continuously. In general, employees in this group do their work, as the designation indicates, in the daytime. The group embraces in most instances the workers in the finishing department and employees engaged in keeping the plant in a state of repair, as blacksmiths, masons, carpenters, machinists, millwrights, general laborers, etc.

There is considerable variation in hours of labor in the different localities and in the different mills. The shift men work either three shifts per day or two shifts per day. In the case of the three-shift men the shifts are 8 hours in length, while most of the two-shift men work 11 hours on the day shift and 13 hours on the night shift. It is understood that in all mills the shifts are changed at regular intervals, so that two-shift employees working at night 13 hours one week work 11 hours by the day the following week, and three-shift employees report for work at a different hour for three successive weeks. For day employees the working day usually consists of either 9 or 10 hours.

In general the day employees work 10 hours in mills in which the shift employees are divided into two shifts and 9 hours where the three-shift system is in force. There are, however, mills in which the shift employees work 8 hours and the day employees 10 hours, and a very few mills in which some employees work two shifts, some three shifts, some by the day 9 hours and some by the day 10 hours.

In the following table the employees for whom information was secured are classified by geographical divisions and by hours worked per day or per shift:

TABLE 69.—Hours worked per day or per shift in selected groups of occupations.

[The percentages have been computed only in cases where data are presented for 50 or more employees.]

Geographical divisions and occupations.	Male employees for whom information was secured.	Per cent of employees working—				
		Three shifts per day.	Two shifts per day.	By the day 9 hours.	By the day 10 hours.	Otherwise than as specified.
Eastern States:						
Occupations—						
In ground-wood mills.....	648	80.9	15.7	3.4	.....	.....
In sulphite mills.....	810	72.6	14.8	9.0	3.2	0.3
Common to ground-wood and sulphite mills.....	939	67.8	11.2	17.8	2.1	1.1
In news-print paper mills.....	2,078	82.2	5.8	9.7	2.1	.1
Common to pulp and paper mills.....	2,308	28.8	6.9	40.6	23.0	.7
Total.....	6,283	59.8	8.5	21.6	9.6	.5
Lake States:						
Occupations—						
In ground-wood mills.....	117	.....	96.6	.....	2.6	.9
In sulphite mills.....	45	.....	(1)	.....	(1)	.....
Common to ground-wood and sulphite mills.....	187	.....	55.6	.....	44.4	.....
In news-print paper mills.....	300	.....	93.7	.....	6.0	.3
Common to pulp and paper mills.....	684	2.3	13.7	.....	83.8	.1
Total.....	1,333	1.2	47.3	.....	51.3	.2
Canada:						
Occupations—						
In ground-wood mills.....	264	38.6	53.0	.....	4.2	4.2
In sulphite mills.....	61	.....	82.0	.....	14.8	3.3
Common to ground-wood and sulphite mills.....	511	10.8	64.2	.....	17.6	7.4
In news-print paper mills.....	320	46.9	42.8	.....	10.3	.....
Common to pulp and paper mills.....	401	11.7	39.9	.....	48.1	.2
Total.....	1,557	22.7	52.3	.....	21.6	3.3
Total in Eastern States.....	6,283	59.8	8.5	21.6	9.6	.5
Total in Lake States.....	1,333	1.2	47.3	.....	51.3	.2
Total in Canada.....	1,557	22.7	52.3	.....	21.6	3.3
Grand total.....	9,173	45.0	21.6	14.8	17.7	.9

Not computed because of the small number of employees for whom information was reported.

Common to pulp and paper mills—												
Working 3 shifts per day.....	727	2	8	15	24	150	77	295	116	21	9	9
Working 2 shifts per day.....	414	2	2	137	46	25	8	5	3			
Working by the day 9 hours.....	937			117	735	65	8	5	1			
Working by the day 10 hours.....	1,266		9	910	220	107	5	3			1	
Total.....	\$ 3,374	2	17	225	1,180	343	94	315	120	21	10	9
Total working 3 shifts per day.....	4,129			48	331	634	1,635	538	229	164	62	86
Total working 2 shifts per day.....	1,979	15	66	773	136	75	27	53	17	22	23	13
Total working by the day 9 hours.....	1,356			2	807	366	40	15	5			3
Total working by the day 10 hours.....	1,624		11	56	1,041	143	6	4			1	
Grand total.....	9,068	15	77	831	1,966	1,218	1,708	610	251	186	86	99

1 Not including 11 men working 11 hours per day and receiving \$0.135 per hour, and 1 man working 11 hours per day and receiving \$0.175 per hour.

2 Not including 3 men working 11 hours per day, 1 receiving \$0.225 per hour and 2 receiving \$0.15 per hour.

3 Not including 46 men working 11 hours per day, 2 receiving \$0.135 per hour, 36 receiving \$0.15 per hour, and 8 receiving \$0.20 per hour, and 2 men working 13 hours per day receiving \$0.22 per hour.

4 Not including 1 man working 11 hours per day receiving \$0.16 per hour, and 2 men working 13 hours per day, 1 receiving \$0.170 per hour and 1 receiving \$0.40 per hour.

5 Not including 15 men working 11 hours per day, 1 receiving \$0.18 per hour, 1 receiving \$0.14 per hour, 4 receiving \$0.145 per hour, and 9 receiving \$0.136 per hour, and 4 working 13 hours per day, 2 receiving \$0.26 per hour and 2 receiving \$0.28 per hour.

TABLE 70.—Rate of pay and hours worked per day or per shift in selected groups of occupations—United States and Canada.

General occupation and hours worked per day or per shift.	Male employees for whom information was secured.	Employees paid per hour—														
		Under 10 cents.	10 and less than 12½ cents.	12½ and less than 15 cents.	15 and less than 17½ cents.	17½ and less than 20 cents.	20 and less than 22½ cents.	22½ and less than 25 cents.	25 and less than 27½ cents.	27½ and less than 30 cents.	30 and less than 32½ cents.	32½ and less than 35 cents.	35 and less than 40 cents.	40 and less than 45 cents.	45 and less than 50 cents.	50 cents and over.
Employees in occupations—																
In ground-wood mills—																
Working 3 shifts per day.....	626					80	169	353	24							
Working 2 shifts per day.....	365	8	126	184	33	2	2									
Working by the day 9 hours....	22				19	3										
Working by the day 10 hours....	14			11	1	2										
Total.....	11,017	8	126	195	133	176	355	24								
In sulphite mills—																
Working 3 shifts per day.....	225					6	29	77	20	26	23	20	9	9	6	
Working 2 shifts per day.....	134					18	21	12	12	3	3	2			3	
Working by the day 9 hours....	28					1	18	5	1							
Working by the day 10 hours....	26					11	3									
Total.....	413		30	45	36	71	94	33	29	26	22	9	9	9		
Common to ground wood and sulphite mills—																
Working 3 shifts per day.....	692					66	137	417	47							
Working 2 shifts per day.....	537	8	35	255	228	8	2					1				
Working by the day 9 hours....	167				2	21	134	10								
Working by the day 10 hours....	193			15	71	89	18									
Total.....	1,559	8	35	270	326	184	201	427	47			1				
In news-print paper mills—																
Working 3 shifts per day.....	1,859				7	195	149	711	152	87	120	33	68	104	143	90
Working 2 shifts per day.....	539	5	15	180	174	28	29	9	33	14	19	20	13			
Working by the day 9 hours....	202				2	31	146	17	6	1						
Working by the day 10 hours....	95		2		37	41	13	1	1							
Total.....	2,695	5	17	180	220	295	337	738	191	102	139	53	81	104	143	90

The above table seems to show a definite relation between the number of hours worked per day or per shift and the rate of pay per hour. It appears that the proportion of employees receiving the higher rates specified is considerably larger in the case of employees working three shifts per day than in the case of employees working two shifts per day. Of the three-shift employees a larger number are paid 22½ and less than 25 cents per hour than are paid at any other specified rate, while the rate reported for the largest number of two-shift employees is 12½ and less than 15 cents per hour. A similar relation is found to exist between the wages of employees working by the day 9 hours, and the wages of employees working by the day 10 hours.

It is evident from the data presented that the earnings in a day or week of employees working three shifts per day, or by the day 9 hours, will often equal or exceed the earnings of employees working two shifts per day or by the day 10 hours. In other words, the shortest hours do not necessarily indicate the smallest earnings.

In the following table the data have been rearranged for the purpose of showing the relation between wages in the United States and wages in Canada. The hours of labor have been disregarded.

TABLE 71.—Rate of pay in selected groups of occupations.

General occupations and geographical division.		Male employees for whom information was secured.	Per cent of employees paid per hour—														
			Under 10 cents.	10 and less than 12 cents.	12 and less than 15 cents.	15 and less than 17 cents.	17 and less than 20 cents.	20 and less than 22 cents.	22 and less than 25 cents.	25 and less than 27 cents.	27 and less than 30 cents.	30 and less than 32 cents.	32 and less than 35 cents.	35 and less than 40 cents.	40 and less than 45 cents.	45 and less than 50 cents.	50 cents and over.
Occupations:																	
In ground wood mills—																	
Eastern States.....	648		5.2	9.3	10.3	23.8	51.4										
Lake States.....	117		12.0	61.5	24.8	1.7											
Canada.....	264	3.0	33.7	23.9	14.4	7.6	8.3	9.1									
Total.....	1,029	.8	13.3	19.0	13.0	17.1	34.5	2.3									
In sulphite mills—																	
Eastern States.....	310		4.8	4.2	5.8	17.7	28.4	7.4	9.4	7.4	7.1	2.9	2.9	1.9			
Lake States.....	45		6.7	13.3	35.6	24.4	6.7	13.3									
Canada.....	61		19.7	45.9	3.3	8.2	6.6	6.6			4.9		4.9				
Total.....	416		7.2	11.3	8.7	17.1	22.8	7.9	7.0	6.3	5.3	2.2	2.2	2.2			
Common to ground wood and sulphite mills—																	
Eastern States.....	939		4.8	7.5	9.1	28.6	45.5	4.7									
Lake States.....	187		37.4	17.1	35.3	9.6					.5						
Canada.....	511	1.6	6.9	30.9	50.9	2.7		.6									
Total.....	1,637	.5	2.1	16.6	22.1	11.2	18.4	26.1	2.9		.1						
In news-print paper mills—																	
Eastern States.....	2,078		2.8	2.5	9.5	14.4	34.9	6.9	6.9	4.7	4.9	1.5	3.2	5.1	6.4	3.4	
Lake States.....	300	1.7	16.3	45.0	9.7	7.7	2.0	5.3	1.7	5.0	6.9	3.0	2.0				
Canada.....	320		4.7	22.8	10.9	4.7	2.2	9.7				3.8	2.8		3.4	6.3	
Total.....	2,698	.2	.6	6.7	8.2	11.0	12.5	27.4	7.1	3.8	5.2	2.0	3.0	3.9	5.3	3.3	
Common to pulp and paper mills																	
Eastern States.....	2,308		5.2	27.3	35.4	9.7	2.9	12.6	5.2	.9	.4	.4					
Lake States.....	684	.2	1.6	52.0	28.5	16.8	.6	5.3									
Canada.....	401	.5	3.0	27.2	48.6	7.0	1.2	6.0	1.0								
Total.....	3,393	.1	.5	7.0	34.8	30.6	10.1	2.8	9.3	3.7	.6	.3	.3				
Total in Eastern States.....		6,283		4.3	13.1	18.8	26.1	8.0	3.9	2.3	1.0	1.3	1.8	2.2	1.1		
Total in Lake States.....	1,233	.4	11.0	45.1	26.1	12.7	1.0	1.8	.4	1.1	.8	.5					
Total in Canada.....	1,557	.6	28.3	37.3	11.0	3.8	3.7	5.4	.3	1.6	.8	.6	.9				
Grand total.....	9,173	.2	.8	9.4	21.9	18.4	13.4	18.6	6.6	2.8	2.0	.9	1.1	1.2	1.7	1.0	

In order to further simplify the comparison of wages in the three localities the data for all employees are presented in the following table by cumulative percentages:

TABLE 72.—*Per cent of employees paid each specified rate or over per hour, by geographical division.*

Rate per hour.	Eastern States.	Lake States.	Canada.	United States and Canada.
30 cents or over.....	47	2.4	5.2	7.9
27½ cents or over.....	13.6	2.8	5.5	10.7
25 cents or over.....	21.6	4.6	10.9	17.3
22½ cents or over.....	47.7	5.1	14.6	35.9
20 cents or over.....	63.6	18.3	18.4	49.3
17½ cents or over.....	82.4	43.4	29.4	67.7
15 cents or over.....	95.5	88.5	66.7	89.6
12½ cents or over.....	99.8	99.5	95.0	99.0
10 cents or over.....	100.0	99.7	99.5	99.8

The curves of the chart presented herewith show for each geographical division the percentage of employees paid each specified rate or over.

An inspection of the above table and of the chart shows that wages are considerably higher in the Eastern States than in the Lake States or in Canada. A larger percentage of the employees in the Eastern States than of the employees in either of the other localities for which data have been secured are paid each specified rate or over.

A comparison of wages in the Lake States with wages in Canada is a somewhat more difficult matter. It will be noted that the percentage of employees paid 30 cents or over, 27½ cents or over, 25 cents or over, 22½ cents or over, and 20 cents or over per hour is higher for Canada than for the Lake States. On the other hand, a considerably larger proportion of the employees in the Lake States than of the employees in Canada are reported as receiving 17½ cents or over, 15 cents or over, and 12½ cents or over per hour.

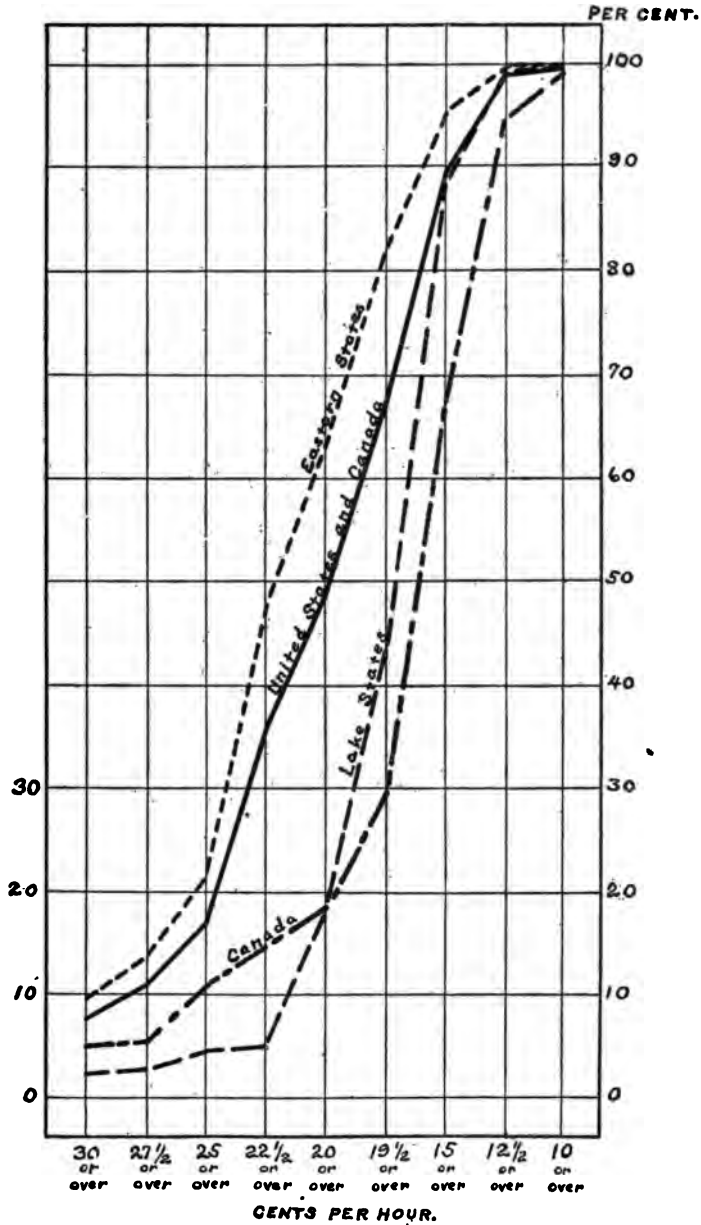
The percentages of the general table show somewhat more clearly than do the cumulative percentages the grouping of the employees at specified wage rates. It will be noted that the group in which the largest proportion of employees is found, both for the Lake States and for Canada, is the group in which the wages paid are 15 cents and less than 17½ cents. The proportion of employees in the group paid 17½ cents and less than 20 cents is, however, considerably larger for the Lake States than for Canada, while the proportion in the group paid 12½ cents and less than 15 cents is considerably larger for Canada than for the Lake States. In other words, 70.2 per cent of all the employees in the Lake States receive 15 cents and less than 20 cents, while 65.6 per cent of all the employees in Canada receive 12½ cents and less than 17½ cents.

It is evident, both from the tables and from the chart, that the proportion of employees paid at the higher rates specified is considerably larger in Canada than in the Lake States, and that the proportion of employees paid at the lower rates specified is larger in the Lake States than in Canada.

An inspection of the general percentage table shows that the relation between the wages in the several localities varies somewhat in the

CHART VII.

Per cent of employees paid at each specified rate or over per hour.



different groups of occupations. It will be noted, however, that in the case of every group wages per hour are higher in the Eastern States than in the Lake States or in Canada.

The wages in the groups of occupations in which the proportion of skilled employees is large—as, for example, occupations in news-print paper mills—are shown to be higher in Canada than in the Lake States, while the contrary is true of the wages in the groups of occupations in which most of the employees do work requiring little skill or training. This is probably due to a relative scarcity in Canada of skilled workers. The representatives of the Tariff Board found that in the Canadian mills visited most of the unskilled workers were Canadians of French descent. On the other hand, nearly all of the employees in the better-paid occupations were of the English-speaking races. Many of these men were of American birth or had worked in paper mills in the United States and had been drawn to Canada by advantageous offers of employment.

OCCUPATIONS IN GROUND-WOOD MILLS.

The two occupations selected for tabulation in the group of occupations in ground-wood mills are those of block handler and grinderman. Data have been secured for 96 block handlers and 933 grindermen—a total of 1,029 employees for the group. The following table shows the proportion of employees in the selected occupations working three shifts per day, the proportion working two shifts per day, the proportion working by the day 9 hours, and the proportion working by the day 10 hours.

TABLE 73.—Hours worked per day or per shift in selected occupations in ground-wood mills.

[The percentages have been computed only in cases where data are presented for 50 or more employees.]

Geographical divisions and occupations.	Male employees for whom information was secured.	Per cent of employees working—				
		Three shifts per day.	Two shifts per day.	By the day 9 hours.	By the day 10 hours.	Otherwise than as specified.
Eastern States:						
Block handler.....	63	77.8	.....	22.2	.....	.....
Grinderman.....	585	81.2	17.5	1.4	.....	.....
Total.....	648	80.9	15.7	3.4	.....	.....
Lake States:						
Block handler.....	7	.....	(¹)	.....	(¹)	.....
Grinderman.....	110	.....	99.1	.....	.....	0.9
Total.....	117	.....	96.6	.....	2.6	.9
Canada:						
Block handler.....	26	(¹)	(¹)	.....	(¹)	(¹)
Grinderman.....	238	41.6	58.4	.....	.....	.....
Total.....	264	38.6	53.0	.....	4.2	4.2
Total in Eastern States.....	648	80.9	15.7	3.4	.....	.....
Total in Lake States.....	117	.....	96.6	.....	2.6	.9
Total in Canada.....	264	38.6	53.0	.....	4.2	4.2
Grand total.....	1,029	60.8	34.5	2.1	1.4	1.2

¹ computed because of the small number of employees for whom information was reported.

Of the employees in selected occupations in ground-wood mills for whom information was secured, 60.8 per cent work three shifts per day, 34.5 per cent work two shifts per day, 2.1 per cent work by the day 9 hours, and 1.4 per cent work by the day 10 hours. In the Eastern States a very large proportion of the employees work three shifts, a smaller proportion work two shifts, only a few work by the day 9 hours, and none work by the day 10 hours. None of the employees in the Lake States work three shifts per day or by the day 9 hours, and none of the employees in Canada work by the day 9 hours. The two-shift system appears to be almost universally in effect in the Lake States, while in Canada the proportion of employees working two shifts is larger than the proportion working three shifts.

In the following table employees in selected occupations in ground-wood mills are classified by geographical division and by rates of pay per hour:

TABLE 74.—Rate of pay in selected occupations in ground-wood mills.

Occupations and geographical divisions.	Male employees for whom information was secured.	Employees paid per hour—								
		Under 10 cents.	10 cents and less than 12½ cents.	12½ cents and less than 15 cents.	15 cents and less than 17½ cents.	17½ cents and less than 20 cents.	20 cents and less than 22½ cents.	22½ cents and less than 25 cents.	25 cents and less than 27½ cents.	27½ cents and over.
Block handlers:										
Eastern States.....	63					25	38			
Lake States.....	7			2	2	1	2			
Canada.....	26			11	12	3				
Total	96			13	14	29	40			
Grinderman:										
Eastern States.....	585			34	60	42	116	333		
Lake States.....	110			12	70	28				
Canada.....	238		8	78	51	35	20	22	24	
Total	933		8	124	181	105	136	355	24	
Total in Eastern States	648			34	60	67	154	333		
Total in Lake States..	117			14	72	29	2			
Total in Canada.....	264		8	89	63	38	20	22	24	
Grand total	1,029		8	137	195	134	176	355	24	

The data of the above table show that wages in the occupations selected for tabulation are about the same in the Lake States as in Canada and considerably higher in the Eastern States than in either the Lake States or Canada.

In the table which follows the wages of male employees in selected occupations in ground-wood mills are shown by maximum, minimum, and median rates.

TABLE 75.—*Rate of pay in selected occupations in ground-wood mills (maximum, minimum, upper, and lower quartiles and median).¹*

[The upper and lower quartiles have been entered only in cases in which information was reported for 50 or more employees.]

Occupations and geographical divisions.	Male employees for whom information was secured.	Rate of pay per hour.				
		Minimum.	Lower quartile.	Median.	Upper quartile.	Maximum.
Block handler:						
Eastern States.....	63	\$0.188	\$0.190	\$0.210	\$0.220	\$0.220
Lake States.....	7	.125	(²)	.167	(²)	.200
Canada.....	26	.135	(²)	.150	(²)	.188
Total.....	96	.125	.150	.190	.220	.220
Grinderman:						
Eastern States.....	585	.125	.217	.230	.230	.240
Lake States.....	110	.125	.150	.160	.175	.188
Canada.....	238	.117	.135	.167	.210	.255
Total.....	933	.117	.160	.220	.230	.255

The terms maximum and minimum are self-explanatory. To find the median, upper quartile, and lower quartile, the members of a group are ranked in descending order according to the quantities under consideration. The median is the quantity halfway down the list thus constituted; the upper quartile is the quantity midway between the median and the maximum and the lower quartile is the quantity midway between the median and the minimum. Where the members of a given group are classified by wages, half receive above and half below the median, one-fourth receive above and three-fourths below the upper quartile, and three-fourths receive above and one-fourth below the lower quartile.

² Not entered because of the small number of employees for whom information was reported.

It will be noted from the above table that the minimum wage paid to block handlers is highest in the Eastern States and slightly higher in Canada than in the Lake States, and that the median wage and the maximum wage are highest in the Eastern States, second highest in the Lake States, and lowest in Canada. The minimum wage for the occupation, 12½ cents, is reported in the Lake States, and the maximum, 22 cents, in the Eastern States. Grindermen are somewhat better paid in Canada than in the Lake States and much better paid in the Eastern States than in Canada. The median and upper quartile are highest for the Eastern States and lowest for the Lake States. The lower quartile is highest for the Eastern States and lowest for Canada, and the maximum is highest for Canada and considerably lower for the Lake States than for the Eastern States. The minimum wage, 11.7 cents, and the maximum, 25.5 cents, are paid in Canadian mills.

The table shows that the wages in the selected occupations in ground-wood mills are, in general, higher in the Eastern States than in the Lake States or Canada.

OCCUPATIONS IN SULPHITE MILLS.

The data have been tabulated for five of the principal occupations in sulphite mills. Of the 416 employees for whom information was secured, 113 were chippers, 86 were digester cooks, 104 were cooks' helpers, 85 were acid makers, and 28 were sulphur burners. In the following table employees in the selected occupations are classified by hours worked per day or per shift.

TABLE 76.—*Hours worked per day or per shift in selected occupations in sulphite mills.*

[The percentages have been computed only in cases where data are presented for 50 or more employees.]

Geographical divisions and occupations.	Male employees for whom information was secured.	Per cent of employees working—				
		3 shifts per day.	2 shifts per day.	By the day 9 hours.	By the day 10 hours.	Otherwise than as specified.
Eastern States:						
Chipper.....	77	59.7	2.6	29.9	7.8	.....
Cook (digester).....	62	74.2	25.8	.....	.....	.....
Cook's helper.....	85	85.9	14.1	.....	.....	.....
Acid maker.....	67	62.7	23.9	6.0	6.0	1.5
Sulphur burner.....	19	(¹)	.....	(¹)	.....	.....
Total.....	310	72.6	14.8	9.0	3.2	0.3
Total in Eastern States.....	310	72.6	14.8	9.0	3.2	0.3
Total in Lake States.....	45	.....	(¹)	.....	(¹)	.....
Total in Canada.....	61	.....	82.0	.....	14.8	3.3
Grand total.....	416	54.1	32.2	6.7	6.3	0.7

¹ Not computed because of the small number of employees for whom information was secured.

The above table shows that 54.1 per cent of the employees for whom data are presented work three shifts per day, that 32.2 per cent work two shifts per day, that 6.7 per cent work by the day 9 hours, and that 6.3 per cent work by the day 10 hours. In the Eastern States a much larger proportion of shift employees work three shifts per day than work two shifts per day, while in Canada all shift employees work two shifts per day.

The following table shows the range in hourly rates of pay among employees in selected occupations in sulphite mills. The arrangement of the data is adapted to a comparison of wages in the different geographical divisions.

TABLE 77.—Rate of pay in selected occupations in sulphite mills.

Occupations and geographical divisions.	Male employees for whom information was secured.	Employees paid per hour—													
		Less than 12½ cents.	12½ and less than 15 cents.	15 and less than 17½ cents.	17½ and less than 20 cents.	20 and less than 22½ cents.	22½ and less than 25 cents.	25 and less than 27½ cents.	27½ and less than 30 cents.	30 and less than 32½ cents.	32½ and less than 35 cents.	35 and less than 40 cents.	40 and less than 45 cents.	45 and less than 50 cents.	50 cents and over.
Chipper:															
Eastern States.....	77		2	2	4	20	49								
Lake States.....	14				13	1									
Canada.....	22		6	16											
Total.....	113		8	18	17	21	49								
Cook (digesters):															
Eastern States.....	62			2	4	4	2	2		11	16	6	9	6	
Lake States.....	13			2		3	3	6							
Canada.....	11					2	2	2		2				3	
Total.....	86			4	4	8	7	10		13	16	6	9	9	
Cook's helper:															
Eastern States.....	85		9	2	3	18	28	20	5						
Lake States.....	6		3	2	1										
Canada.....	13		6	5		1				1					
Total.....	104		18	9	4	19	28	20	5	1					
Acid maker:															
Eastern States.....	67		4	7	4	3	3	1	24	12	6	3			
Lake States.....	10			2		8									
Canada.....	8				2	2	2	2							
Total.....	85		4	9	6	13	5	3	24	12	6	3			
Sulphur burner:															
Eastern States.....	19				3	10	6								
Lake States.....	2				2										
Canada.....	7			7											
Total.....	28			7	5	10	6								
Total in Eastern States.....	310		15	13	18	55	88	23	29	23	22	9	9	6	
Total in Lake States.....	45		3	6	16	11	3	6							
Total in Canada.....	61		12	28	2	5	4	4		3				3	
Grand total.....	416		30	47	36	71	95	33	29	26	22	9	9	9	

It appears from the table that the general level of wages is considerably higher in the Eastern States than in the Lake States and somewhat higher in the Lake States than in Canada. The rate reported for the largest number of employees is 22½ cents and less than 25 cents in the Eastern States, 17½ and less than 20 cents in the Lake States, and 15 cents and less than 17½ cents in Canada.

The table next presented shows the hourly wages paid in selected occupations in sulphite mills, by maximums, minimums, quartiles, and medians.

TABLE 78.—Rate of pay in selected occupations in sulphite mills (maximum, minimum, upper and lower quartiles, and median).¹

(The upper and lower quartiles have been entered only in cases in which information was reported for 50 or more employees.)

Occupation and geographical division.	Male employees for whom information was secured.	Rate of pay per hour.				
		Minimum.	Lower quartile.	Median.	Upper quartile.	Maximum.
Chipper:						
Eastern States	77	\$0.146	\$0.200	\$0.234	\$0.235	\$0.242
Lake States	14	.175	(*)	.178	(*)	.200
Canada	22	.125	(*)	.150	(*)	.168
Total	113	.125	.175	.200	.234	.242
Cook (digester):						
Eastern States	62	.167	.310	.330	.375	.459
Lake States	13	.150	(*)	.230	(*)	.250
Canada	11	.200	(*)	.250	(*)	.450
Total	86	.150	.230	.320	.360	.459
Cook's helper:						
Eastern States	85	.125	.220	.242	.250	.290
Lake States	6	.125	(*)	.148	(*)	.175
Canada	13	.145	(*)	.150	(*)	.300
Total	104	.125	.167	.235	.250	.300
Acid maker:						
Eastern States	67	.145	.208	.280	.310	.399
Lake States	10	.150	(*)	.200	(*)	.210
Canada	8	.185	(*)	.218	(*)	.250
Total	85	.145	.200	.280	.290	.399
Sulphur burner:						
Eastern States	19	.188	.220	.220	.234	.242
Lake States	2	.175	(*)	.183	(*)	.190
Canada	7	.150	(*)	.160	(*)	.160
Total	28	.150	(*)	.220	(*)	.242

¹ For explanation of the statistical terms, see Table 76.² Not entered because of the small number of employees for whom information was reported.

The median and maximum wages of chippers are higher in the Lake States than in Canada and much higher in the Eastern States than in the Lake States, while the minimum in this occupation is higher in the Lake States than in the Eastern States. The maximum hourly rate for chippers, 24.2 cents, is reported in the Eastern States and the minimum, 12.5 cents, in Canada. Among the digester cooks for whom information was secured the maximum and the median rates are highest in the Eastern States, second highest in Canada, and lowest in the Lake States. The minimum reported is higher in Canada than in either of the other geographical divisions. Half of the digester cooks in the Eastern States are paid 33 cents or over per hour, half of those in Canada 25 cents or over per hour, and half of those in the Lake States 23 cents or over per hour. It will be noted that the highest rate paid to digester cooks in the Eastern States, 45.9 cents, is only very slightly higher than the maximum in Canada. The minimum, 15 cents, is reported for the Lake States.

In the case of cook's helpers the maximum hourly rate is highest in Canada and considerably higher in the Eastern States than in the Lake States; the median rate is highest in the Eastern States and slightly higher in Canada than in the Lake States, and the minimum is higher in Canada than in the Eastern States or the Lake

States. The maximum wage reported is 30 cents and the minimum is 12.5 cents. The maximum wage paid to acid makers is 38.9 cents and the minimum is 14.5 cents. Both of these figures are reported for mills in the Eastern States. It will be noted that both the maximum and minimum rates in this occupation are higher in Canada than in the Lake States and that the median rate is highest in the Eastern States and slightly higher in Canada than the Lake States. Among the sulphur burners the maximum, minimum, and median rates are highest in the Eastern States, second highest in the Lake States, and lowest in Canada. As the number of sulphur burners for whom data were secured is small, a further analysis of the data for this occupation would be of doubtful value.

The table shows that wages in selected occupations in sulphite mills are in general highest in the Eastern States and somewhat higher in Canada than in the Lake States.

OCCUPATIONS COMMON TO GROUND-WOOD AND SULPHITE MILLS.

Data have been tabulated for 1,637 employees in selected occupations common to ground-wood and sulphite mills. Of these employees 537 are barker men, 320 are screenmen, 39 are decker men, 379 are wet-machine tenders, and 362 are pressmen. In the following table the employees for whom data have been secured are classified according to hours worked per day or per shift:

TABLE 79.—*Hours worked per day or per shift in selected occupations common to ground-wood and sulphite mills.*

[The percentages have been computed only in cases where data are presented for 50 or more employees.]

Geographical divisions and occupations.	Male employees for whom information was secured.	Per cent of employees working—				
		3 shifts per day.	2 shifts per day.	By the day 9 hours.	By the day 10 hours.	Otherwise than as specified.
Eastern States:						
Barkerman.....	296	41.9	.....	51.0	6.8	0.3
Screenman.....	198	82.8	11.6	1.5	.....	4.0
Deckerman.....	30	(1)	(1)	.....	.....	(1)
Wet-machine tender.....	156	61.5	38.5	.....	.....	.....
Pressman.....	250	87.3	7.7	5.0	.....	.....
Total.....	939	67.8	11.2	17.8	2.1	1.1
Lake States:						
Barkerman.....	81	.....	.....	.....	100.0	.....
Screenman.....	35	.....	(1)	.....	(1)	.....
Deckerman.....	4	.....	(1)	.....	.....	.....
Wet-machine tender.....	66	.....	100.0	.....	.....	.....
Pressman.....	1	.....	.....	.....	(1)	.....
Total.....	187	.....	55.6	.....	44.4	.....
Canada:						
Barkerman.....	160	.....	21.3	.....	56.3	22.5
Screenman.....	87	19.5	78.1	.....	.....	2.3
Deckerman.....	5	(1)	(1)	.....	.....	.....
Wet-machine tender.....	157	21.0	79.0	.....	.....	.....
Pressman.....	102	2.0	98.0	.....	.....	.....
Total.....	511	10.8	64.2	.....	17.6	7.4
Total in Eastern States.....	939	67.8	11.2	17.8	2.1	1.1
Total in Lake States.....	187	.....	55.6	.....	44.4	.....
Total in Canada.....	511	10.8	64.2	.....	17.6	7.4
Grand total.....	1,637	42.3	32.8	10.2	11.8	2.9

..... computed because of the small number of employees for whom information was secured.

Of the employees for whom data are presented in the above table, 42.3 per cent work three shifts per day, 32.8 per cent work two shifts per day, 10.2 per cent work by the day 9 hours, and 11.8 per cent work by the day 10 hours. The proportion of employees working two shifts per day is highest in Canada, second highest in the Lake States, and lowest in the Eastern States, while the proportion of employees working by the day 10 hours is highest in the Lake States, second highest in Canada, and lowest in the Eastern States. None of the employees in the Lake States work three shifts per day, and none of the employees in the Lake States or in Canada work by the day 9 hours, while of the employees in the Eastern States for whom data are presented 67.8 per cent work three shifts per day and 17.8 per cent work by the day 9 hours.

In the following table employees in selected occupations common to ground-wood and sulphite mills are classified by geographical division and by range in hourly rates of pay:

TABLE 80.—Rate of pay in selected occupations common to ground-wood and sulphite mills.

Occupations and geographical divisions.	Male employees for whom information was secured.	Employees paid per hour—									
		Under 10 cents.	10 and less than 12½ cents.	12½ and less than 15 cents.	15 and less than 17½ cents.	17½ and less than 20 cents.	20 and less than 22½ cents.	22½ and less than 25 cents.	25 and less than 27½ cents.	27½ and less than 30 cents.	30 cents and over.
Barkerman:											
Eastern States.....	296				10	32	122	130			
Lake States.....	81				2	63	16		2		
Canada.....	160		2	34	109	14	1				
Total.....	537		2	34	121	109	139	130	2		
Screenman:											
Eastern States.....	198			13	13	22	31	119			
Lake States.....	35			22	13						
Canada.....	87	3	4	29	33	18					
Total.....	320	3	4	64	59	40	31	119			
Deckman:											
Eastern States.....	30					2	1	27			
Lake States.....	4			4							
Canada.....	5				2		3				
Total.....	39			4	2	2	4	27			
Wet-machine tender:											
Eastern States.....	156			26	33	20		36	42		
Lake States.....	66			44	17	2	2			1	
Canada.....	157	5	26	59	55	1	8		3		
Total.....	379	5	26	128	105	23	10	36	45	1	
Pressman:											
Eastern States.....	269			6	14	9	115	115			
Lake States.....	1					1					
Canada.....	102	3	36	36	61		2				
Total.....	382	3	42	42	75	10	117	115			
Total Eastern States.....	989			44	70	85	269	427	44		
Total Lake States.....	187			70	32	66	18			1	
Total Canada.....	511	8	35	158	260	33	14		3		
Grand total.....	1,687	8	35	272	362	184	301	427	47	1	

The table shows that the proportion of employees who receive the higher rates specified is considerably larger in the Eastern States than in the Lake States and larger in the Lake States than in Canada.

Additional basis for a comparison of wages in the United States with wages in Canada is afforded by the table next presented, in which the wage rates are shown by maximums, minimums, quartiles, and medians.

TABLE 81.—*Rate of pay in selected occupations common to ground-wood and sulphite mills: (Maximum, minimum, upper and lower quartiles, and median.)*¹

[The upper and lower quartiles have been entered only in cases in which information was reported for 50 or more employees.]

Occupations and geographical divisions.	Male employees for whom information was secured.	Rate of pay per hour.				
		Minimum.	Lower quartile.	Median.	Upper quartile.	Maximum.
Barkerman:						
Eastern States.....	296	\$0.150	\$0.200	\$0.215	\$0.234	\$0.268
Lake States.....	81	.180	.175	.180	.188	.200
Canada.....	160	.104	.150	.150	.150	.210
Total.....	537	.104	.167	.200	.215	.263
Screenman:						
Eastern States.....	198	.125	.200	.230	.230	.243
Lake States.....	35	.125	(²)	.135	(²)	.160
Canada.....	87	.070	.135	.150	.167	.190
Total.....	320	.070	.150	.190	.230	.243
Deckerman:						
Eastern States.....	30	.183	(²)	.230	(²)	.234
Lake States.....	4	.125	(²)	(²)	(²)	.125
Canada.....	5	.150	(²)	.220	(²)	.220
Total.....	39	.125	(²)	.230	(²)	.234
Wet-machine tender:						
Eastern States.....	156	.125	.150	.211	.263	.263
Lake States.....	66	.125	.140	.145	.150	.225
Canada.....	157	.083	.125	.125	.150	.230
Total.....	379	.083	.125	.150	.188	.225
Pressman:						
Eastern States.....	259	.125	.220	.223	.230	.230
Lake States.....	1	.175	(²)	(²)	(²)	.175
Canada.....	102	.104	.125	.167	.167	.200
Total.....	362	.104	.167	.220	.230	.230

¹ For explanation of the statistical terms, see Table 75.

² Not entered because of the small number of employees for whom information was reported.

Among the barkermen for whom data are presented in the above table the lower quartile, median, and upper quartile are highest in the Eastern States, second highest in the Lake States, and lowest in Canada; the maximum is highest in the Eastern States and slightly higher in Canada than in the Lake States, and the minimum is highest in the Lake States and much higher in the Eastern States than in Canada. Half of the employees in the Eastern States are paid 21.5 cents or over per hour, half of those in the Lake States are paid 18 cents or over per hour, and half of those in Canada are paid 15 cents or over per hour. The maximum wage and median wage of screenmen are highest in the Eastern States, second highest in Canada, and lowest in the Lake States, while the minimum is higher in the Eastern States and the Lake States than in Canada. The

highest wage reported in this occupation is 24.2 cents and the lowest 7 cents per hour. For deckermen the maximum and minimum are highest in the Eastern States, second highest in Canada, and lowest in the Lake States. Half of the deckermen in the Eastern States are paid 23 cents or over per hour and half of those in Canada 22 cents or over per hour.

The maximum wage of wet-machine tenders, 32.5 cents, is reported in the Lake States and the minimum, 8.3 cents, in Canada. The lower quartile and median are highest in the Eastern States and lowest in Canada; the upper quartile is much higher in the Eastern States than in either the Lake States or Canada, and the maximum is higher in the Eastern States than in Canada. Among the pressmen the maximum wage per hour is highest in the Eastern States and lowest in Canada, while the minimum is highest in the Lake States and lowest in Canada. Half of the pressmen in the Eastern States are paid 22.3 cents or over per hour and half of those in Canada are paid 16.7 cents or over per hour.

Because of the small number of employees for whom data were secured in several of the occupations in the Lake States and in Canada, it is difficult to make a general comparison between the localities. It is clear, however, that wages are in general considerably higher in the Eastern States than in either the Lake States or Canada. The figures also seem to indicate a slightly lower level of wages in Canada than in the Lake States.

OCCUPATIONS IN NEWS-PRINT PAPER MILLS.

The data have been tabulated for 2,698 employees in 10 selected occupations in news-print paper mills. In the table which follows the employees for whom information has been secured are classified by hours worked per day or per shift and by geographical divisions:

TABLE 82.—Hours worked per day or per shift in occupations in news-print paper mills.

[The percentages have been computed only in cases where data are presented for 50 or more employees.]

Geographical divisions and occupations.	Male employees for whom information was secured.	Per cent of employees working—				
		3 shifts per day.	2 shifts per day.	By the day 9 hours.	By the day 10 hours.	Otherwise than as specified.
Eastern States:						
Beaterman.....	475	92.0	8.0			
Clay and size man.....	14			(¹)	(¹)	
Machine tender.....	331	93.4	6.3			0.3
Back tender.....	352	92.6	7.4			
Third hand.....	296	90.5	9.5			
Fourth hand.....	243	98.4	1.6			
Fifth hand.....	87	97.7	2.3			
Broke hustler.....	41	(¹)	(¹)		(¹)	
Finisher.....	213	2.3		82.2	15.0	.5
Cutter.....	26	(¹)		(¹)	(¹)	
Total.....	2,078	82.2	5.8	9.7	2.1	.1
Total Eastern States.....	2,078	82.2	5.8	9.7	2.1	.1
Total Lake States.....	300		93.7		6.0	.3
Total Canada.....	320	46.9	42.8		10.3	
Grand total.....	2,698	68.9	20.0	7.5	3.5	.1

¹ Not computed because of the small number of employees for whom information was reported.

Of the employees in the Eastern States for whom data are presented, ~~82.2 per cent~~ work three shifts per day, 5.8 per cent work two shifts ~~per day~~, 9.7 per cent work by the day 9 hours, and 2.1 per cent work by the day 10 hours. In the Lake States 93.7 per cent of the employees work two shifts per day, 6 per cent work by the day 10 hours, and no employees work three shifts per day or by the day 9 hours, while in Canada 46.9 per cent of the employees work three shifts per day, 42.8 per cent work two shifts per day, 10.3 per cent work by the day 10 hours, and none work by the day 9 hours. This table shows that a very large proportion of all the employees in news-print paper mills are shift workers. The three-shift system is well established in the Eastern States. In the Lake States, on the other hand, none of the employees work three shifts, while in Canada the two-shift workers and the three-shift workers are reported in about equal numbers. Nearly all of the day workers in the Eastern States work 9 hours a day, while all the day workers in the Lake States and in Canada work 10 hours per day.

The following table shows wages in selected occupations in news-print paper mills. In this table employees are classified by geographical division and by range in hourly rates of pay:

TABLE 83. —Rate of pay in selected occupations in news-print paper mills.

Occupation and geographical division.	Male employees for whom information was secured.	Employees paid per hour—														
		Under 10 cents.	10 and less than 12½ cents.	12½ and less than 15 cents.	15 and less than 17½ cents.	17½ and less than 20 cents.	20 and less than 22½ cents.	22½ and less than 25 cents.	25 and less than 27½ cents.	27½ and less than 30 cents.	30 and less than 32½ cents.	32½ and less than 35 cents.	35 and less than 40 cents.	40 and less than 45 cents.	45 and less than 50 cents.	50 cents. and over.
Beaterman:																
Eastern States.....	475		28	10	107	18	280	12	6	3		1				
Lake States.....	94		14	75	20	2										
Canada.....	71		49													
Total.....	640		91	85	132	20	280	12	6	3		1				
Clay and size man:																
Eastern States.....	14			3	8	1	1	1								
Lake States.....	6			1	3	2										
Canada.....	1			1												
Total.....	21			5	11	3	1	1								
Machine tender:																
Eastern States.....	331					2	2	4	5	4	4	6	104	130	70	
Lake States.....	39							4	5	15	9	6				
Canada.....	49					3		1			7	7		11	20	
Total.....	419					5	2	9	10	19	20	19	104	141	90	
Back tender:																
Eastern States.....	352		5	9		11	10	49	83	95	28	59	1	2		
Lake States.....	42		4		8	14	5	11								
Canada.....	46		2	2				13		22	5	2				
Total.....	440		11	11	8	25	15	73	83	117	33	61	1	2		
Third hand:																
Eastern States.....	296		21	5	2	14	185	69								
Lake States.....	42	5	6	19	8	2										
Canada.....	43		11	11	2	6	7	17								
Total.....	381	5	27	35	12	22	192	86								

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It appears from the above table that a considerably larger proportion of employees in the Eastern States than of the employees in the Lake States or in Canada are paid at the higher rates specified in the table. The rate received by the largest number of employees in eastern mills is 22½ cents and less than 25 cents. The proportion of employees receiving the higher rates specified is somewhat higher in Canadian mills than in the Lake States.

In the following table the wages are shown by maximums, minimums, upper and lower quartiles, and medians:

TABLE 84. — *Rate of pay in selected occupations in news-print paper mills (maximum, minimum, upper and lower quartiles, and median).*¹

[The upper and lower quartiles have been entered only in cases in which information was reported for 50 or more employees.]

Occupations and geographical divisions.	Male employees for whom information was secured.	Rate of pay per hour.				
		Minimum.	Lower quartile.	Median.	Upper quartile.	Maximum.
Beaterman:						
Eastern States.....	475	\$0.135	\$0.188	\$0.230	\$0.230	\$0.360
Lake States.....	94	.138	.150	.158	.160	.190
Canada.....	71	.125	.138	.143	.175	.208
Total.....	640	.125	.167	.220	.230	.360
Clay and size man:						
Eastern States.....	14	.150	(*)	.190	(*)	.263
Lake States.....	6	.100	(*)	.178	(*)	.200
Canada.....	1	.166	(*)	(*)	(*)	.166
Total.....	21	.150	(*)	.190	(*)	.263
Machine tender:						
Eastern States.....	331	.208	.438	.460	.480	.525
Lake States.....	39	.250	(*)	.313	(*)	.363
Canada.....	49	.200	(*)	.469	(*)	.500
Total.....	419	.200	.415	.450	.480	.525
Back tender:						
Eastern States.....	352	.146	.280	.310	.330	.470
Lake States.....	42	.125	(*)	.210	(*)	.265
Canada.....	46	.140	(*)	.313	(*)	.375
Total.....	440	.125	.263	.292	.315	.470
Third hand:						
Eastern States.....	296	.125	.230	.240	.240	.270
Lake States.....	42	.092	(*)	.152	(*)	.216
Canada.....	43	.166	(*)	.226	(*)	.266
Total.....	381	.092	.219	.240	.240	.270
Fourth hand:						
Eastern States.....	243	.133	.223	.230	.230	.242
Lake States.....	36	.125	(*)	.150	(*)	.170
Canada.....	43	.125	(*)	.183	(*)	.200
Total.....	322	.125	.188	.230	.230	.242
Fifth hand:						
Eastern States.....	87	.125	.220	.223	.235	.235
Lake States.....	2	.125	(*)	(*)	(*)	.125
Canada.....	15	.125	(*)	.150	(*)	.188
Total.....	104	.125	.220	.220	.235	.235

¹ For explanation of the statistical terms, see Table 75.

² Not entered because of the small number of employees for whom information was reported.

TABLE 84.—Rate of pay in selected occupations in news-print paper mills (maximum, minimum, upper and lower quartiles, and median)—Continued.

Occupations and geographical divisions.	Male employees for whom information was secured.	Rate of pay per hour.				
		Minimum.	Lower quartile.	Median.	Upper quartile.	Maximum.
Broke hustler:						
Eastern States.....	41	\$0.150	(1)	\$0.190	(1)	\$0.235
Lake States.....	19	.138	(1)	.150	(1)	.170
Canada.....	17	.104	(1)	.120	(1)	.125
Total.....	77	.104	\$0.138	.160	\$0.190	.235
Finisher:						
Eastern States.....	213	.150	.200	.200	.200	.281
Lake States.....	15	.150	(1)	.170	(1)	.200
Canada.....	27	.150	(1)	.175	(1)	.183
Total.....	255	.150	.183	.200	.200	.281
Cutter:						
Eastern States.....	26	.175	(1)	.200	(1)	.294
Lake States.....	5	.175	(1)	.200	(1)	.250
Canada.....	8	.100	(1)	.168	(1)	.200
Total.....	39	.100	(1)	.200	(1)	.294

¹ Not entered because of the small number of employees for whom information was reported.

It appears from the table that among beatermen the maximum wage, 36 cents, is paid in the Eastern States, and the minimum, 12.5 cents, in Canada. The maximum and upper quartile are highest in the Eastern States, second highest in Canada, and lowest in the Lake States; the median and lower quartile are highest in the Eastern States, second highest in the Lake States, and lowest in Canada; and the minimum is highest in the Lake States, second highest in the Eastern States, and lowest in Canada. The maximum wage of clay and size men is highest in the Eastern States and lowest in Canada; the minimum is highest in Canada and lowest in the Eastern States and the median is higher in the Eastern States than in the Lake States. Half of the machine tenders in the Eastern States for whom information was secured are paid 46 cents or over per hour, half of those in the Lake States are paid 31.3 cents or over per hour and half of those in Canada are paid 46.9 cents or over per hour. The maximum wage of machine tenders is slightly higher in the Eastern States than in Canada and is lowest in the Lake States; the median is slightly higher in Canada than in the Eastern States and is lowest in the Lake States, and the minimum is higher in the Lake States than in either the Eastern States or in Canada.

Among back tenders the maximum wage, 47 cents, is paid in the Eastern States and the minimum, 12.5 cents, in the Lake States. The median is highest in Canada, slightly lower in the Eastern States, and lowest in the Lake States, while the maximum and minimum are highest in the Eastern States, second highest in Canada, and lowest in the Lake States. The maximum and median wages of third hands are highest in the Eastern States, second highest in Canada and lowest in the Lake States, while the minimum wage is highest in Canada,

second highest in the Eastern States, and lowest in the Lake States. Half of the third hands in the Eastern States are paid 24 cents or over per hour; half of those in Canada are paid 22.6 cents or over per hour, and half of those in the Lake States are paid 15.2 cents or over per hour.

In the case of the fourth hands for whom data were reported the maximum and median are highest in the Eastern States, second highest in Canada, and lowest in the Lake States. The minimum, 12.5 cents, is reported both in the Lake States and in Canada. Half of the fifth hands in the Eastern States are paid 22.3 cents or over per hour, and half of those in Canada are paid 15 cents or over per hour. The maximum for fifth hands is highest in the Eastern States, second highest in Canada, and lowest in the Lake States, while the minimum is the same in all three localities. In the case of broke hustlers the maximum, minimum, and median are highest in the Eastern States, second highest in the Lake States, and lowest in Canada. Half of the finishers in the Lake States are paid 20 cents or over per hour, half of those in Canada are paid 17.5 cents or over per hour, and half of those in the Lake States are paid 17 cents or over per hour. The maximum wage of finishers is highest in the Eastern States and higher in the Lake States than in Canada, while the same minimum is reported for all three localities. The maximum for cutters is highest in the Eastern States, second highest in the Lake States, and lowest in Canada. Half of the cutters in the Eastern States and in the Lake States are paid at the rate of 20 cents or over per hour, while half of those in the Lake States are paid at the rate of 16.8 cents or over per hour.

It is evident from the table that employees in selected occupations in news-print paper mills are much better paid in the Eastern States than in either the Lake States or Canada. The employees in Canadian mills appear to receive in general somewhat higher wages than employees in mills in the Lake States, this being particularly true in the case of machine tenders and the other members of the machine crew. It will be noted that the occupations mentioned in the last sentence are those in which the higher rates of pay are reported.

OCCUPATIONS COMMON TO PULP AND PAPER MILLS.

Of the 3,393 employees in selected occupations common to pulp and paper mills for whom data have been tabulated, 144 are engineers, 237 are oilers, 585 are firemen, and 2,427 are laborers. In the following table these employees are classified by geographical division and by hours worked per day or per shift.

TABLE 85.—Hours worked per day or per shift in selected occupations common to pulp and paper mills.

[The percentages have been computed only in cases where data are reported for 50 or more employees.]

Geographical divisions and occupations.	Male employees for whom information was secured.	Per cent of employees working—				
		3 shifts per day.	2 shifts per day.	By the day 9 hours.	By the day 10 hours.	Otherwise than as specified.
Eastern States:						
Engineer.....	119	80.7	13.4		2.5	3.4
Oiler.....	155	71.6	7.1	16.8	4.5	
Fireman.....	415	88.7	8.9	.7	.7	1.0
Laborer.....	1,619	5.5	5.9	56.1	31.9	.6
Total.....	2,308	28.8	6.9	40.6	23.0	.7
Lake States:						
Engineer.....	16		(1)		(1)	
Oiler.....	41		(1)		(1)	(1)
Fireman.....	62	25.8	74.2			
Laborer.....	565		.2		99.8	
Total.....	684	2.3	13.7		83.8	.1
Canada:						
Engineer.....	9		(1)		(1)	(1)
Oiler.....	41		(1)		(1)	
Fireman.....	108	42.6	52.8		4.6	
Laborer.....	243	.4	29.6		70.0	
Total.....	401	11.7	39.9		48.1	.2
Total Eastern States.....	2,308	28.8	6.9	40.6	23.0	.7
Total Lake States.....	684	2.3	13.7		83.8	.1
Total Canada.....	401	11.7	39.9		48.1	.2
Grand total.....	3,393	21.4	12.2	27.6	38.2	.6

¹ Not computed because of the small number of employees for whom information was reported.

Of the employees for whom data are presented in the above table, 21.4 per cent work three shifts per day, 12.2 per cent work two shifts per day, 27.6 per cent work by the day 9 hours, 38.2 per cent work by the day 10 hours, and less than 1 per cent work otherwise than specified. The proportion of three-shift employees is largest in the Eastern States and much larger in Canada than in the Lake States; the proportion of two-shift employees is largest in Canada, second largest in the Lake States, and smallest in the Eastern States; and the proportion of employees working by the day 10 hours is largest in the Lake States, second largest in Canada, and smallest in the Eastern States. None of the employees in the Lake States or in Canada, as compared with 40.6 per cent of the employees in the Eastern States, work by the day 9 hours. It will be seen that the hours of labor are shortest in the Eastern States and in general somewhat shorter in Canada than in the Lake States.

The following table shows the range in hourly rates of pay, by geographical division:

TABLE 86.—*Rate of pay in selected occupations common to pulp and paper mills.*

Occupations and geo- graphical divisions.	Male em- ployees for whom informa- tion was secured.	Employees paid per hour—												
		Under 10 cents.	10 and less than 12½ cents.	12½ and less than 15 cents.	15 and less than 17½ cents.	17½ and less than 20 cents.	20 and less than 22½ cents.	22½ and less than 25 cents.	25 and less than 27½ cents.	27½ and less than 30 cents.	30 and less than 32½ cents.	32½ and less than 35 cents.	35 and less than 40 cents.	40 cents and over.
Engineer:														
Eastern States...	119	.....	.....	.....	4	5	.....	3	30	37	21	10	9	.....
Lake States.....	16	.....	.....	.....	2	4	5	.....	2	.....	.....	.....	.....	.....
Canada.....	9	.....	.....	.....	5	2	1	1	.....	.....	.....	.....	.....	.....
Total	144	.....	.....	.....	11	11	6	7	32	37	21	10	9	.....
Oilier:														
Eastern States...	155	.....	2	5	5	42	52	46	3	.....	.....	.....	.....	.....
Lake States.....	41	.....	1	5	23	9	2	1	.....	.....	.....	.....	.....	.....
Canada.....	41	1	5	8	16	8	1	1	1	.....	.....	.....	.....	.....
Total	237	1	8	18	44	59	55	48	4	.....	.....	.....	.....	.....
Fireman:														
Eastern States...	415	.....	.....	13	21	8	34	13	244	82	.....	.....	.....	.....
Lake States.....	62	.....	.....	2	31	23	6	.....	.....	.....	.....	.....	.....	.....
Canada.....	108	.....	1	34	24	2	1	21	21	4	.....	.....	.....	.....
Total	585	.....	1	49	76	33	41	34	265	86	.....	.....	.....	.....
Laborers:														
Eastern States...	1,619	.....	2	101	599	761	137	4	14	1	.....	.....	.....	.....
Lake States.....	565	.....	.....	4	300	159	102	.....	.....	.....	.....	.....	.....	.....
Canada.....	243	1	6	67	150	16	2	1	.....	.....	.....	.....	.....	.....
Total	2,427	1	8	172	1,049	936	241	5	14	1	.....	.....	.....	.....
Total Eastern States.	2,308	.....	4	119	629	816	223	66	291	120	21	10	9	.....
Total Lake States....	684	.....	1	11	356	195	115	4	2	.....	.....	.....	.....	.....
Total Canada.....	401	2	12	109	195	28	5	24	22	4	.....	.....	.....	.....
Grand total....	3,393	2	17	239	1,180	1,039	343	94	315	124	21	10	9	.....

It appears from the above table that the proportion of employees earning the higher rates specified is much larger in the Eastern States than in either the Lake States or Canada. While the difference between the Lake States and Canada in the proportion of the employees earning the higher rates is not great, wages appear on the whole to be somewhat higher in the Lake States than in Canada.

In the table which follows the wages of male employees in selected occupations common to pulp and paper mills are shown by maximums, minimums, upper and lower quartiles, and medians.

TABLE 87.—*Rate of pay in selected occupations common to pulp and paper mills (maximum, minimum, upper and lower quartiles, and median).*¹

[The upper and lower quartiles have been entered only in cases in which information was reported for 50 or more employees.]

Occupations and geographical divisions.	Male employees for whom information was secured.	Rate of pay per hour.				
		Minimum.	Lower quartile.	Median.	Upper quartile.	Maximum.
Engineer:						
Eastern States.....	119	\$0.167	\$0.270	\$0.283	\$0.300	\$0.357
Lake States.....	16	.167	(*)	.200	(*)	.250
Canada.....	9	.150	(*)	.167	(*)	.225
Total.....	144	.150	.250	.280	.300	.357
Oiler:						
Eastern States.....	155	.100	.190	.220	.235	.250
Lake States.....	41	.113	(*)	.160	(*)	.225
Canada.....	41	.090	(*)	.150	(*)	.250
Total.....	237	.090	.160	.190	.220	.250
Fireman:						
Eastern States.....	415	.125	.250	.250	.250	.294
Lake States.....	62	.143	.150	.170	.180	.200
Canada.....	108	.100	.146	.160	.230	.280
Total.....	585	.100	.183	.250	.250	.294
Laborer:						
Eastern States.....	1,619	.100	.150	.187	.190	.280
Lake States.....	565	.125	.170	.170	.175	.220
Canada.....	243	.083	.138	.150	.155	.225
Total.....	2,427	.083	.150	.170	.190	.280

¹ For explanation of the statistical terms, see Table 75.

* Not entered because of the small number of employees for whom information was reported.

The above table shows that half of the engineers reported in the Eastern States are paid at a rate of 28 cents or over per hour, that half of those in the Lake States are paid at a rate of 20 cents or over per hour, and that half of those in Canada are paid at a rate of 16.7 cents or over per hour. The maximum wage for all engineers, 35.7 cents, is reported in the Eastern States and the minimum, 15 cents, in Canada. The maximum is somewhat higher in the Lake States than in Canada, while the minimum is the same for the Lake States and the Eastern States. The median wage of oilers is highest in the Eastern States, second highest in the Lake States, and lowest in Canada; the maximum is lower in the Lake States than in the Eastern States or Canada; and the minimum is highest in the Lake States, second highest in the Eastern States, and lowest in Canada. In the case of firemen, the maximum and upper quartile are highest in the Eastern States, second highest in Canada, and lowest in the Lake States; the median and lower quartile are highest in the Eastern States, second highest in the Lake States, and lowest in Canada; and the minimum is highest in the Lake States, second highest in the Eastern States, and lowest in Canada. The maximum wage of laborers, 28 cents, is reported in the Eastern States and the minimum, 8.3 cents, in Canada. The upper quartile and median are highest in the Eastern States, second highest in the Lake States, and lowest in Canada; while the lower quartile and minimum are highest

in the Lake States, second highest in the Eastern States, and lowest in Canada.

It is evident from the figures presented in the tables that wages in occupations common to pulp and paper mills are much higher in the Eastern States than in the Lake States or in Canada. The medians show that the rates paid are in general somewhat lower in Canada than in the Lake States. In the case of laborers, who constitute two-thirds of the group, wages are decidedly lower in Canada than in the Lake States.

SUMMARY.

The data relative to labor conditions in the wood-pulp and news-print paper industry will be reviewed briefly in the following paragraphs. Original data have been secured by the Tariff Board for 17,609 employees, of whom 69.2 per cent are in mills in the Eastern States, 13.6 per cent in mills in the Lake States, and 17.2 per cent in Canadian mills. Less than 2 per cent of all the employees for whom information has been secured are females. The data secured show that a large proportion of the workers in the industry are of foreign birth, and that of the foreign a large number are of the races of southern and eastern Europe.

In the wood-pulp and news-print paper industry the length of the working day for men employed by the day is, in most cases, either 9 or 10 hours. The shift workers who, in the mills for which schedules were secured, outnumber the day workers, are divided either into three shifts or into two shifts. In the Eastern States the three-shift system is in general use, and in Canada over two-fifths of the shift workers work three shifts per day. On the other hand, all of the shift employees in the Lake States for whom information was secured work two shifts per day. None of the day employees in Canada or in the Lake States work nine hours per day, as compared with over two-thirds of the day employees in eastern mills. It will be seen that the hours of labor are, upon the whole, longer in Canada than in the Eastern States, and longer in the Lake States than in Canada.

The data presented show that hourly wages are higher in the case of employees working under the three-shift system than in the case of employees working under the two-shift system, and higher in the case of employees working by the day 9 hours than in the case of employees working by the day 10 hours.

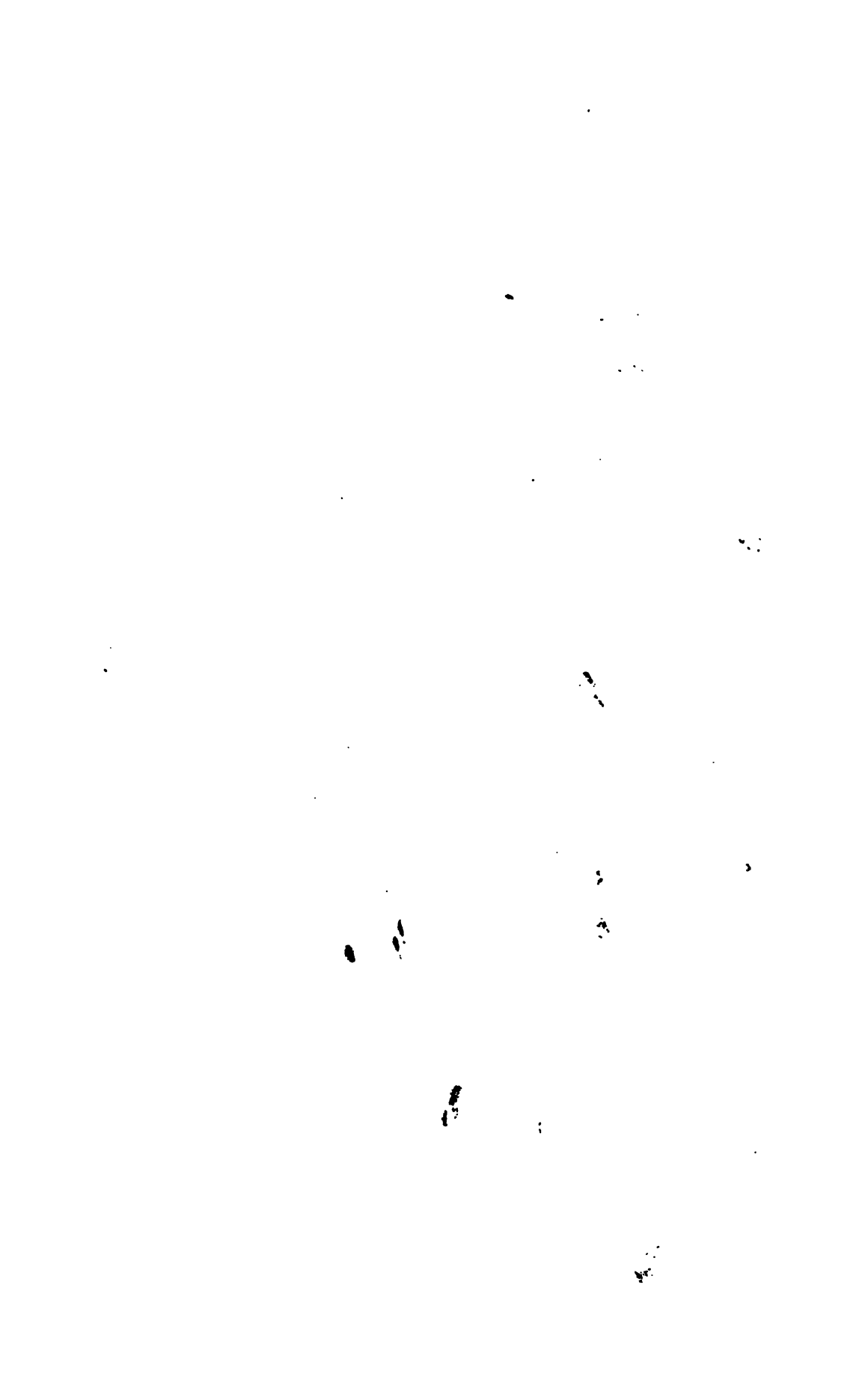
The hourly wages paid are considerably higher in the Eastern States than in the Lake States or in Canada. This is true of each of the groups of occupations selected for tabulation and of all or nearly all of the occupations within the groups.

The difference between wages in the Lake States and wages in Canada is small. In some occupations the Canadian mills, and in others the mills in the Lake States, pay the higher hourly rates. Wages are in general higher in Canada than in the Lake States in the skilled occupations of the industry. Digester cooks, machine tenders, and back tenders are paid higher hourly rates in Canada than in the Lake States. On the other hand, the wages of the men in occupations requiring little skill or training, as, for example, chippers, block handlers, barkermen, and common laborers, are considerably higher in the Lake States than in Canada.



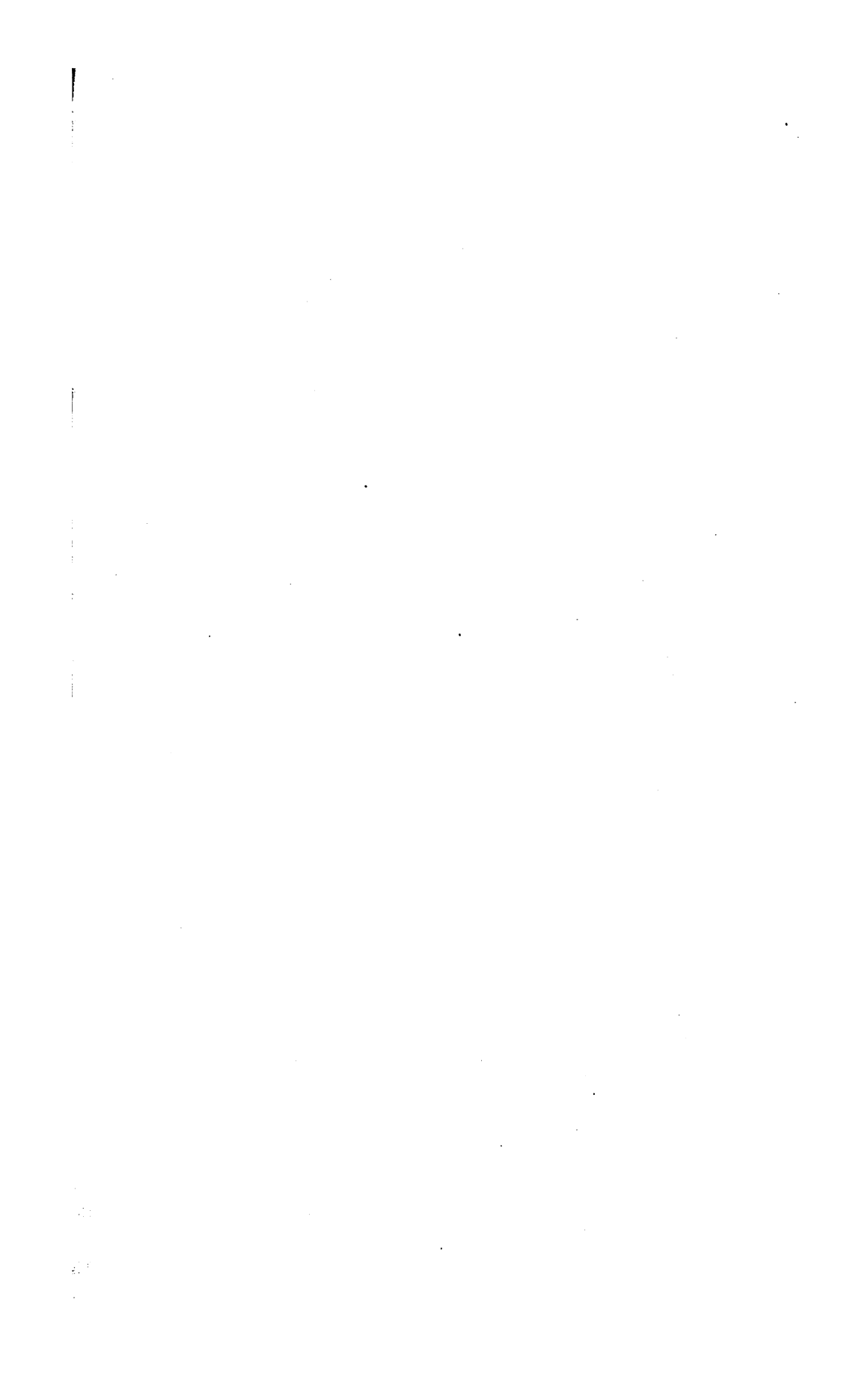








1. The first part of the document is a list of names and titles, including "The Hon. Mr. Justice" and "The Hon. Mr. Justice".



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